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Production of Aggregates from River Gravels in the Plains Region

Part II—River Equipment for Peculiar Requirements

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IN THE PREVIOUS ARTICLE, April 23, 1932, it was pointed out that the western tributaries of the Missouri and Arkansas rivers are normally shallow streams, with bottoms consisting of more or less unstable and shifting sands. The Kansas, or as it is locally called the "Kaw," possesses a more or less definite channel and is occasionally crossed by a rocky ledge. In some of the other streams the water level is frequently below the river bed! If these conditions were invariable it would not be particularly annoying, but they do vary.

All of these rivers drain enormous watersheds. These watersheds are normally dry and will absorb from 2 to 4 in. of water without perceptible runoff. If, however, in a period of rainy weather the watersheds become wet, or if more than 4 in. falls within a given week, the streams rise with great suddenness.

This characteristic has several direct influences on gravel dredging. In the first place no stationary equipment can be installed in the channels, or on the lower terraces. In the second place all floating equipment must be so arranged that it can conform to sudden changes of level and so that it will not break loose. Finally drainage boards and property owners near the banks are perpetually worried over the condition of the channel, and this causes them to protest quickly if waste sand or abandoned equipment is so placed as to suggest possible interference with the flow of water.

Editors' Note

THIS is the second of a series of articles begun in the April 23 issue of Rock Products, which treats very comprehensively the sand and gravel industry of a large and economically important part of the United States.

Dredging with small floating equipment of shallow draft is the almost universal practice. The peculiar conditions encountered have led to the development of several ingenious devices.—The Editors.

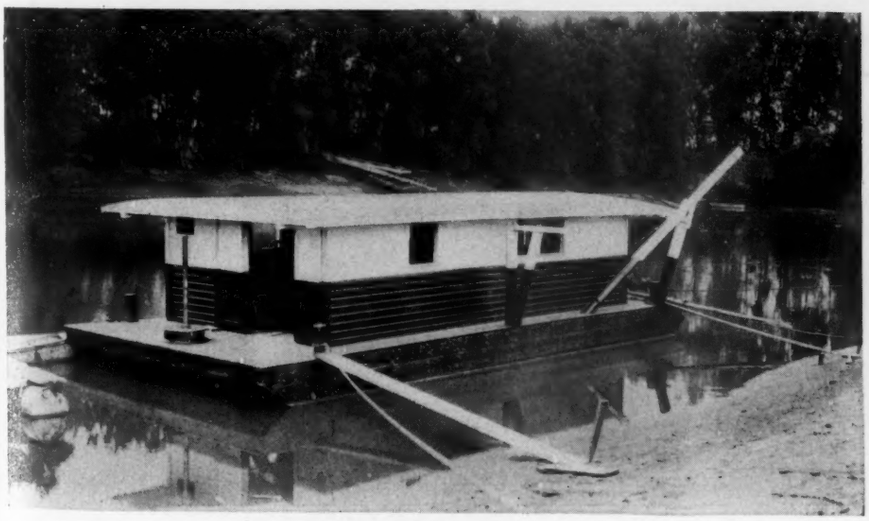


Fig. 1. Recent typical medium-draft barge for an 8-in. pump

Dredges Operate in Ponds in Preference to River Bed

These conditions, together with royalties charged by the state for gravel dredged from navigable streams, have caused numerous concerns to locate, not on the streams but in artificially dredged ponds, somewhere on the nearby flood plain. Locations of this type have some marked advantages. For example, the water is deep, and barges can be built heavy and deep enough to support heavy equipment, there is little wracking action due to waves and currents, and small likelihood of loss, going aground or getting adrift. Generally speaking, there is little need of maintaining an extra emergency force. On the other hand, it must be remembered that many of the most desirable locations are below flood level, and in such cases precautions must be taken to secure the equipment in case of an overflow.

Originally all plants used the rivers and drew their materials from surface bars. Since the rivers renewed the bars as rapidly as they were depleted this was an excellent arrangement. When, however, the underlying "blue gravels" began to be dredged, the

Ice field in the Kansas river, 1929, and, at right, barge which was thrown ashore by the ice along with its entire pipe line and string of pontoons

situation changed, for these were laid down under totally different geologic conditions and cannot be renewed.

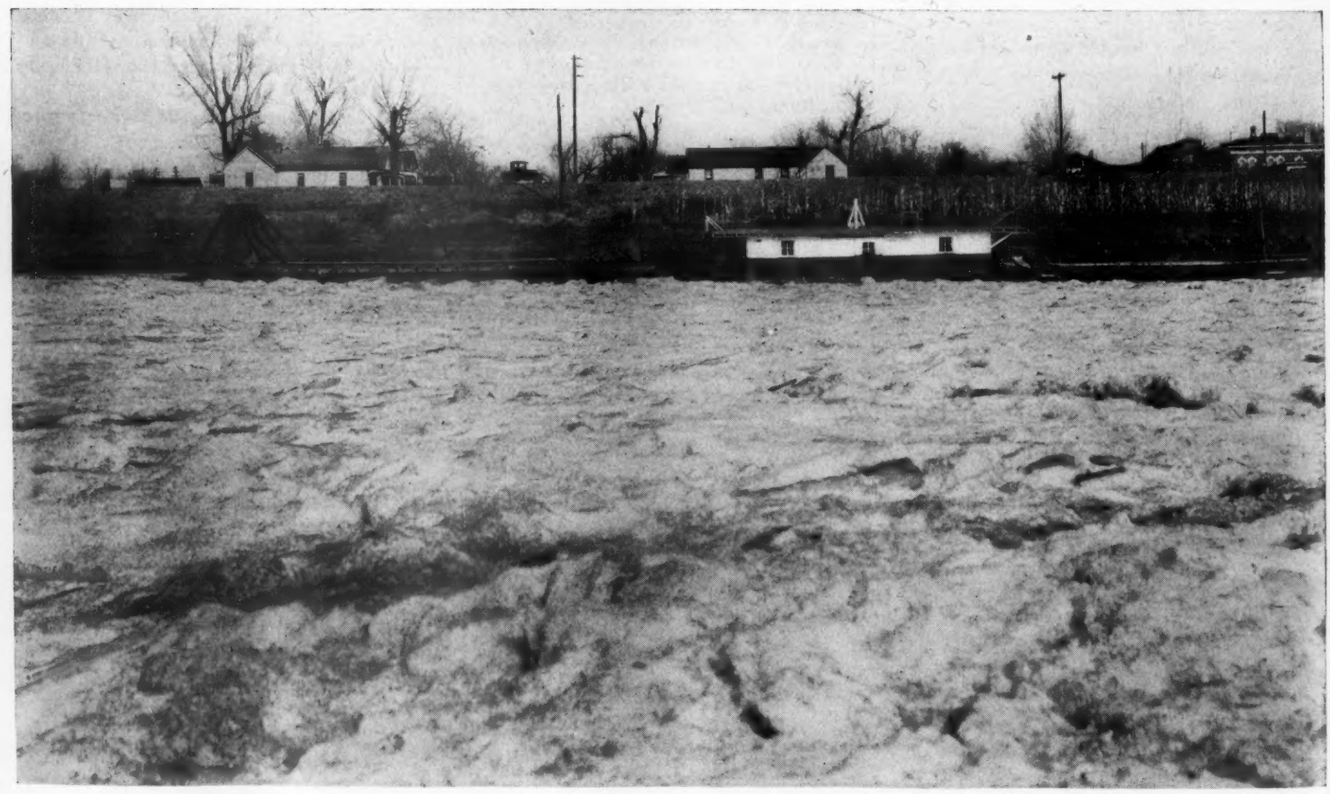
Flood Conditions

As already pointed out, the rivers differ considerably in their characteristics. Thus serious floods and heavy ice are rare on the Arkansas and Little Arkansas. Heavy ice on the Platte is the rule rather than the exception, while the Kansas seems to have no very definite habits, at times remaining open and at low level, as during the season of 1930-31, while at others it develops serious ice jams and reaches stages of 30 ft. and higher. On the whole, conditions on the Kansas are the most severe and hence the most interesting.

The Kansas above Lawrence drains a watershed of some 38,000,000 acres. The annual runoff from this area, however, is seldom as high as 4,000,000 acre feet, that is to say in normal years the runoff is only a little over an inch of water from a watershed that receives 25 in. of rain. There is little snow in this area and hence spring freshets are not serious, but in late May and early June (the season is earlier on the Arkansas and later on the Platte) thunderstorms furnish sudden large supplies of water which run off, and when these storms are exceptionally heavy and follow in rapid succession serious rises occur. Ordinarily the river stage is between 3 and 6 ft., but in March, 1902, the stage was 1.8 ft. and the total discharge 100 cu. ft. per sec. On May 31 of the next year (1903) the gage stood at 28.75 ft., and the discharge was 221,000 cu. ft. per sec. Testimony as to the speed of the current on this latter occasion differs. It certainly averaged 10 ft. per sec. and probably reached speeds of 10 or 12 miles an hour in some places.

Ice Conditions

During the winter of 1930-1931 no ice formed in the river, but during the season of 1929-1930 close to a foot of ice formed while the river was at the 3-ft. stage, and serious damage to floating equipment followed. Serious "ice gorges" occurred at certain points in 1930 and in previous years. The older sand operators recall a moving gorge which consisted of a great wall of angular ice fragments moving slowly down the river snapping steel cables like kite strings and



Large digger and wooden barge with pipe line subjected to heavy ice pressure at Topeka in 1929

Wooden barge with corrugated iron pontoons

grinding barges and pontoons to kindling wood.

Such events, though not common, cause tremendous damage when they do occur and the chance of recurrence is great enough to require precautionary measures. The operators depend largely on flood warnings issued by the state meterologist and U. S. Weather Bureau, who in turn utilize the results of stream gagings and discharge estimates prepared by the State Water Commission working in conjunction with the U. S. Geological Survey. This service has proved so valuable that when the legislature of Kansas failed to make appropriation for its share of the stream gaging work the sand and gravel producers carried the expense until the state was convinced of the necessity for continuing the work. Where ice is feared many operators, particularly on the lower Kaw, suspend operations just before Christmas and haul all this equipment out for the winter.

Current Conditions

When at average stage—about 4 ft.—the Kansas has a maximum current of about 2 miles an hour. On the outer side of the curves the channel is about 60 ft. across and from 5 to 15 ft. deep. Between curves, where the channel changes sides, the water becomes very shoal and even the most experienced pilot cannot pick the deepest waterway with any certainty.

A 10-ton boat drawing 12 in. of water has recently traveled from Tecumseh (12 miles below Topeka) to Manhattan, but she was aground at one point for two hours. A lighter boat drawing 8 in. has proved very convenient. A pumping barge normally drawing 2 ft. was recently floated from Manhattan to Holliday (near Kansas City) but it was necessary to wait for high water, to remove pump and motor, to get her over the dam at Lawrence with jacks and skids, and to pull off one bar after another by wire line and winch.

How very important light craft is was well illustrated some years ago when, after a sharp rise, one barge was grounded near the bank. A bar quickly built around it, wedging it in and this bar built up so rapidly that the barge could not dredge itself out in any reasonable length of time. The surrounding sand was not suitable for sale, and for a brief period it became necessary, in order to fill contracts, to put teams and Fresno scrapers on the bar, thus dragging the suitable material to the dredge—a most unusual situation.

Pumping Practically Universal

For reasons to be taken up in a later article the centrifugal pump has now become practically the only method of excavation used in these western streams. Some of the dredges possess no auxiliary equipment, a few have rotating cutters, and at Topeka all of the 10-in. pumps have powerful ladder diggers. These last have proved most valuable, not so much because of their power to loosen the gravels, as because they will lift and carry away large boulders and heavy slabs of rock which will otherwise "blind" the pump suction.

Up to the present no diggers especially designed for the conditions met in the Kansas have been introduced. Those in use were apparently designed for water in which there was some wave action, but they have not always shown ability to stand the battering of ice, drift, sudden cave-ins of deep boulder beds, or the wrenching action which occurs when a current suddenly throws the pump barge sideways, while the digger is on the bottom. Despite minor structural failures and considerable overhaul and repairs, however, these machines have paid for themselves over and over.

Barges (Dredge Hulls) Standardized

The barges in use have become pretty much standardized. Practically all those on the Kansas above Lawrence and most of those on the Arkansas and the tributaries of both are of wooden construction. The usual dimensions are about 20 ft. by 40 ft. for barges carrying 8-in. pumps and 26 ft. by 60 ft. for those carrying 10-in. pumps. In many cases it is not necessary to build such large barges for the 10-in. pumps, but it is only recently that any attention has been paid to the selection of light-weight driving machinery.

Some of the barges have an A-frame for lifting the suction pipe, while others carry it from a bracket, generally placed well aft on the starboard side. All are equipped with comfortable deck houses. The barge shown in Fig. 1 draws 16 in. of water when fully loaded.

Details of Barge Construction

Practically all the barges are built on the longitudinal system, the fore and aft keelsons, stantions and deck, together with the longitudinal bulkheads, being strong enough to permit the barge to be stranded in any position without starting a leak. Transverse frames are completed by cross-bottom planking and are also designed to stand any stress which may develop.

Rake pieces have been found superior to bolted knees in the keelsons, and curved rakes for a variety of reasons are superior to those having a sharp angle. The ribs are generally cut to keep clear of the bottom along the sides to prevent rot and the stantions are often provided with "salt boxes" which have proved of value.

One or two barges have been built of creosoted timber, but the results have been disappointing. For good results this material should be sawed and bored to detail draw-

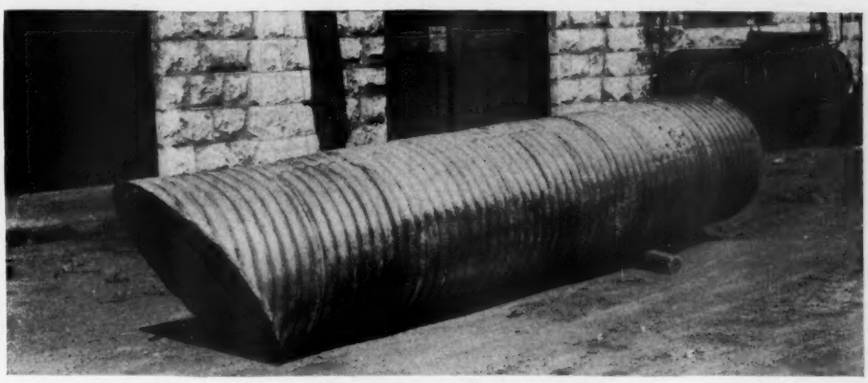


Fig. 3. Crrugated iron pontoon

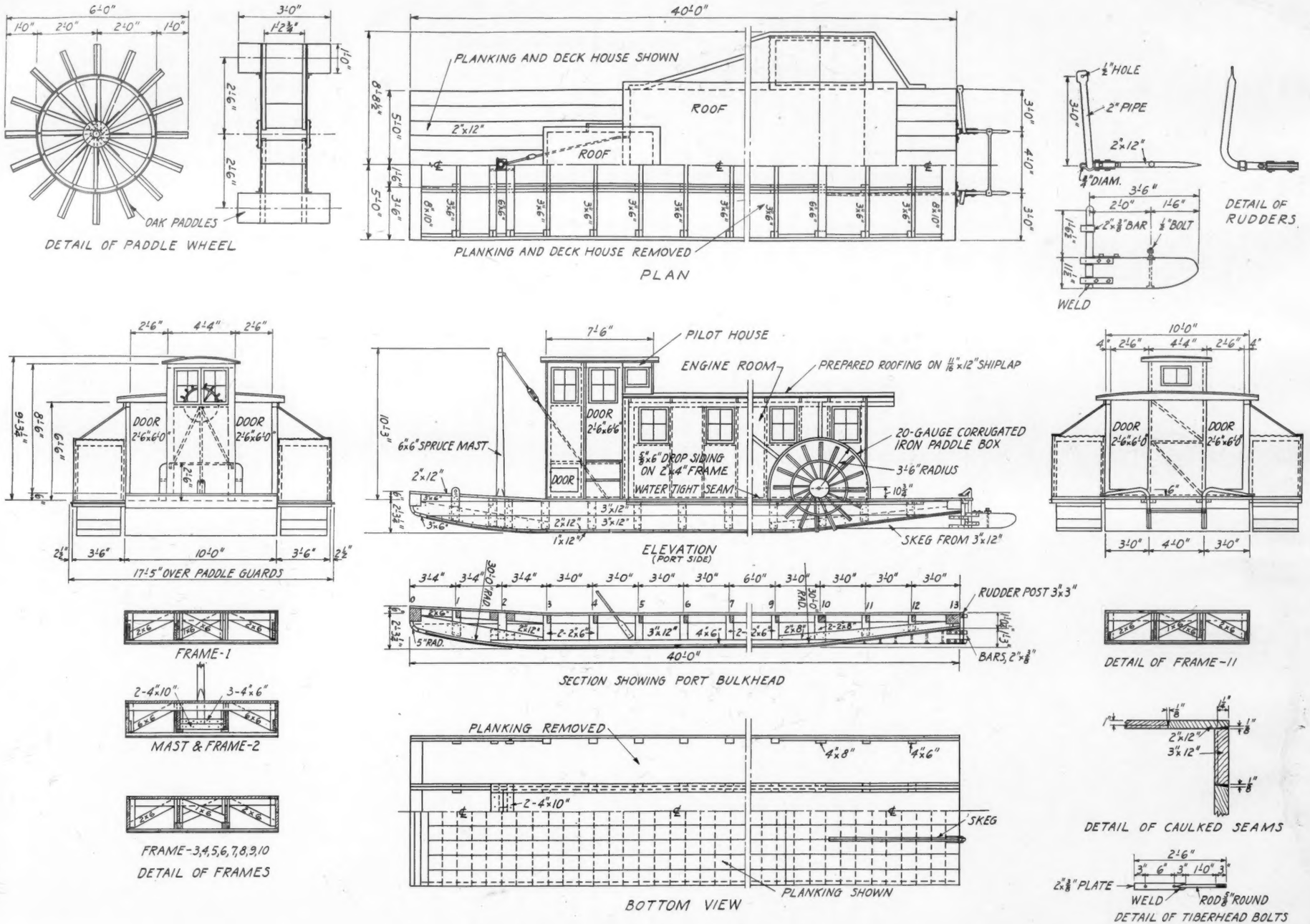


Fig. 4. Details of tug boat used on Kansas River

ings and then treated. When sawed or bored after treatment rot starts at the exposed fibers and works along the interior till sudden collapse takes place.

On the Kansas many boats have an outer sheathing for protection against ice. The use of metal for this purpose is sound practice, but nailing on an extra plank with its upper edge just above water is poor policy. The upper surface of this plank and the joint with the side planking remains damp, dry rot starts and the main side planking may be completely eaten through in from three to five years.

Despite the effect of dry rot and the occasional attacks of white ants, wooden barges have proved very satisfactory. They have stood up well in ice jams and in collision with bridge piers. They are seldom wracked enough to leak and they can be easily repaired. As a result they are used almost exclusively over a very wide area.

Wood Compared With Steel Construction

Recently the increasing use of steel barges on the Mississippi and Missouri has attracted some attention and their introduction has been suggested. Most of the wooden barges carry 3-in. S4S bottom planking and 4-in. S4S side planking. Three-inch S4S weighs damp about 9 lb. per sq. ft. Steel plate ¼-in. thick weighs 10 lb.

The sides of the barges are ordinarily 3 to 4 ft. high and as a result, according to common structural practice, even with 5/16-in. plate, the transverse frames must be placed not to exceed 30 in. on centers. It will be seen at once there is no saving in weight.

Wood construction costs approximately 12 c. per board foot or about 3.5 c. per lb. Steel construction will run about $120 a ton or 6 c. per lb. Hence there is no saving in cost.

Many steel designs are based on riveted joints made tight by caulking and these joints, if crippled by collision or ice, will leak. Finally unless good quality steel is used, well painted and with a dry interior, rust may eat through thin plates as rapidly as dry rot eats wood. If steel is to be used better designs must be adopted.

The writer has recently requested preliminary bids on some small barges of a totally new type. In these the design is based on the principles used in all-metal airplane construction. It is too early to say what success will attend these boats, but they offer the possibility of building barges of rust resistant plate, which will weigh half as much as a similar wooden barge and should cost about the same amount per cubic foot.

Dredging Practice—Pipe Lines

Fig. 2 shows an inexpensive type of wooden barge which offers little resistance to the current and which can also be used as a lighter.

Spuds are rarely used. Mooring lines are much safer and more positive. Indeed in many places unless the spuds were 100 ft. in length they would find no reliably stationary material which they could grip.

It is now almost universal practice to bring the sand and gravel ashore by pumping through pipe lines carried on pontoons. The time honored float made from gasoline drums is still widely used in ponds and where the current is slack. In swifter rivers, however, a different type of equipment is necessary.

Fig. 3 shows a float of corrugated metal which while more expensive is very convenient. It is practically ice-proof and unsinkable. It rusts only very slowly and can be rolled across sand bars or up and down stream banks where other types would be handled with difficulty.

In a stream with a two-mile current and barely a foot of effective depth the transpor-

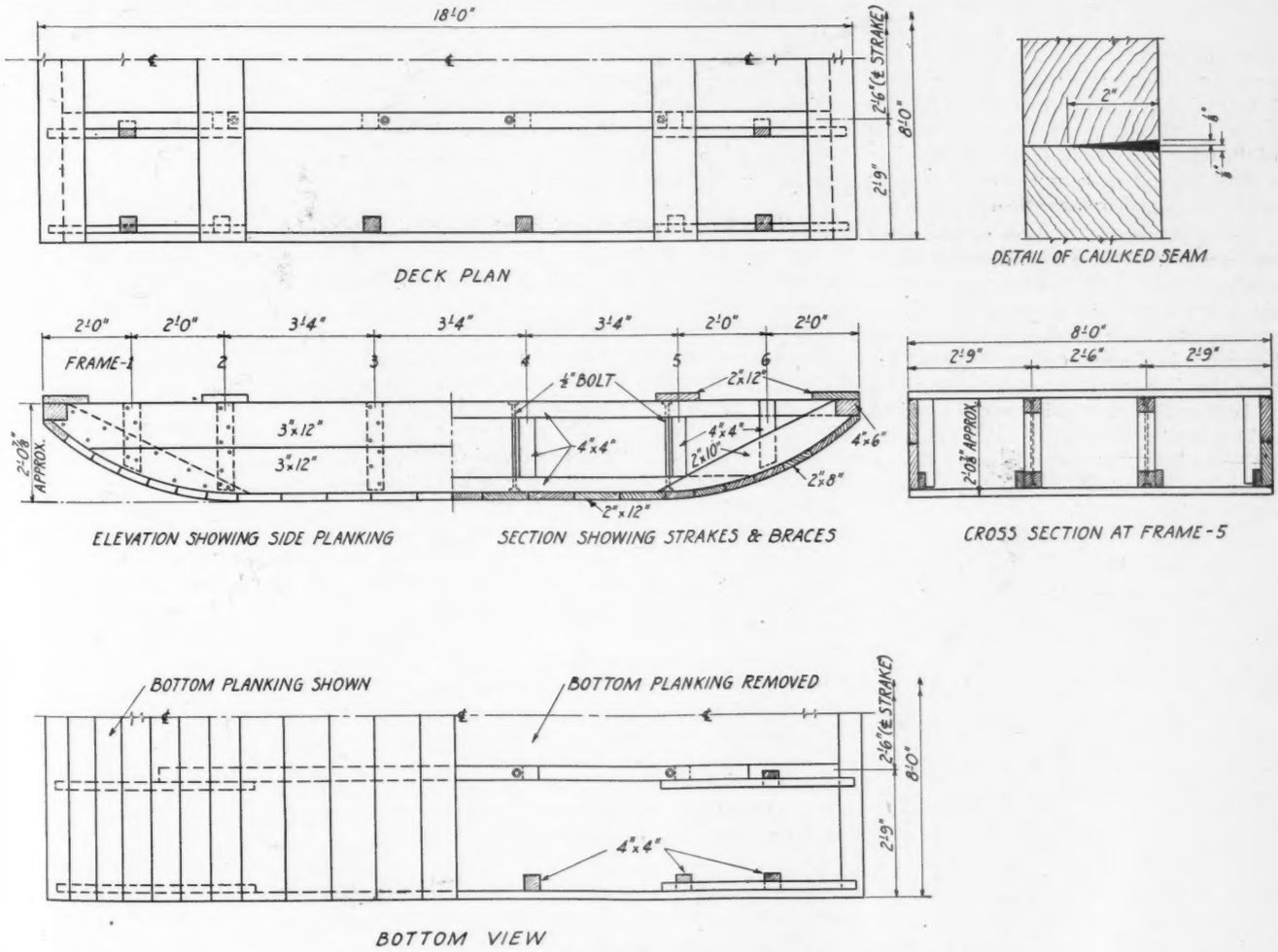


Fig. 2. Inexpensive type of wooden barge

tation of sand by barges or scows is of course out of the question. Nevertheless it has been found that a "tug" can be used to advantage. Such boats can assist barges to change position, handle strings of pontoons, carry out mooring lines, chase equipment lost in high water and perform much other useful work. Due to their small propellers and deep draught outboard motors are ineffective. The ideal boat is one with broad propelling surfaces, shallow draft and fairly high speed, a group of characteristics which do not commonly go together.

Tug Boats

At least three tugs have been tried out on the upper Kansas, of which only one, *Consumer's No.* 1, Fig. 4, is now in commission. This boat has a displacement of 10 tons, is driven by a 60-hp. engine and has a speed of 8 miles per hour. She can easily handle the heaviest barges on the river under normal conditions. Her draft is 12 in. The paddle wheels, which are somewhat smaller than would have been the case had a higher speed reduction been available, are driven through an old truck differential and by the use of band brakes controlled from the pilot house either wheel can be locked while the speed of the other is doubled. This boat has given a good account of herself, but still lighter draft and faster boats are needed.

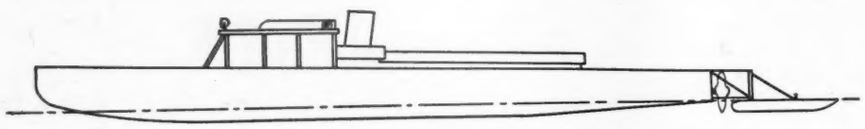


Fig. 5. Outline drawing of proposed ideal tug boat

Two problems are involved, namely, drive and steering. Where a draft of 6 in. is sought, at first glance it seems impossible to obtain any appreciable thrust except with a stern wheel. These are objectionable because they work in the wake of the boat and because they interfere with tow lines, but above all because they greatly increase the weight to be supported at the stern. It is not practicable to design so shallow a flat-bottomed boat with a clean "run" at the stern and still support a heavy wheel.

Side wheelers carry their weight better, but there are other drawbacks. A dip of 6 in. gives a paddle very little thrust, and if the blades are made longer, it becomes difficult to support the outer end of the shaft, while the boat becomes too wide to work between snags and in narrow channels.

Tunnel boats have been suggested but are out of the question. The water carried in the tunnels will weigh down the stern at low speeds, while when traveling fast in shallow water suction develops at the bow and pressure builds up in the tunnels forcing the bow under. This characteristic has given serious trouble in the Missouri in 6 ft. of water and with tunnels in which the upper propeller tips were below the normal water line.

There remain two possible solutions, the "caterpiller" type and the surface screw. The vane wheel, a slow-speed surface screw patented by Denny Bros. of Dumbarton, Scotland, has some of the characteristics necessary, and is being seriously considered. The ideal boat would be one which when towing would use its horsepower to develop a heavy thrust, but which when running free would "plane," thus reducing its slippage and thrust. A preliminary shear drawing of such a boat is shown in Fig. 5.

Steering in 6 in. of water is also no easy task, particularly if the rudder must also work at times in water full of cornstalks, straw and miscellaneous drift. *Consumer's No.* 1 was originally designed with two balanced rudders at the extreme corners of the stern. On the advice of men experienced on the Missouri she was finally built with unbalanced rudders protected by skegs. The results have not been entirely satisfactory since the skegs make the boat sluggish to the helm, and the long unbalanced rudders require considerable muscular effort at the wheel. For work in such shallow water the rudders should be balanced, should be placed in the slip stream of the driving mechanism and should be directly accessible at all times. Furthermore, they should be so constructed as to be buoyant, thus aiding the stern in carrying any loads placed there.

Handling Floating Equipment

The methods of handling the floating equipment varies with the methods used in working the deposit. Where a company has bought land and created a "pond" the development is generally methodical though not always economical. Under ideal conditions there should be no waste and the dredge should proceed from one side to the other of the property taking the entire deposit as it goes if possible. Waste generally occurs and this waste frequently has to be returned to the pond. If this is done it should never be allowed to cover a deposit which may later be valuable, but many "pond" plants are merely skimming their deposits with little thought of tomorrow.

In the river channels conditions are different. Some plants are still operating on the old basis of working the surface bars, and in these cases the barge is simply shifted in rather narrow territory to take advantage of changes in the river currents. This system is inexpensive and efficient in plants manufacturing fine aggregate only.

Where the underlying gravels are mined the situation is somewhat different; there is just so much material in place and the barge must keep changing position. It would be very advantageous if the barge could work steadily from one side of the deposit to the other. In practice this is seldom accomplished since the present methods of classification are imperfect and the barge men search for lenses which may be adapted to fill some particular specification. As a result the gravel deposits are first cut up, by holes, into which finer material pours. Some of these holes or pits are finally cut through into each other leaving more or less isolated ridges and peaks. These generally "slump" down or their location is lost. In either case they are seldom recovered and the system is wasteful in the extreme.

Operating Reforms Necessary

When the average sand plant cost $1000 this waste was of little importance. The plants simply moved, but today matters are somewhat different. Every available site on good trackage is under lease, and the new plants in course of erection and proposed are costing in the neighborhood of $80,000 apiece. To amortize these larger investments there must be a large quantity of "ore in sight"; and what is more, methods must be used which will insure that this "ore," in other words the underlying virgin gravels, is actually mined. The system of picking a "mighty likely lookin' bar" will no longer pay dividends. Under the new conditions the gravels must be mined as they come, sorted into marketable products and stockpiled till needed.

Another practice which must soon be abandoned is that of throwing large rocks and boulders back into the channel after they have been hooked and drawn up by diggers, or caught in "stone traps." When thrown back these ultimately form piles or "nests" which protect the gravels beneath and prevent dredging. They should in every case be lightered ashore. Whether they are then most valuable as material for crushing or as rip rap for bank protection is debatable, but they should not be permitted to return to the excavation.

Anchoring Dredges

As already indicated, nearly all the streams in the area under discussion are subject to sudden rise, and when in flood they carry enormous masses of drift ranging from straw and hay to uprooted cottonwoods, 3 ft. or less in diameter. It is impossible to secure mooring cables to boats in mid-channel and all floating equipment has to be swung in to the bank. Various methods have been used.

Some years ago it was customary to break up the pipe lines into sections and tow each group of pontoons ashore. It was quite usual for one section at least to get adrift and be lost. Many plants were also obliged to carry waste flumes to the center of the river and these were invariably wrecked. As experience has been gained it has become more and more customary to handle all equipment from a swivel connection of some type. Some of the most recent plants have the pontoon line made practically rigid by clamp-

ing solidly to a straight run of pipe welded together and by spiking foot boards to each pontoon. In this arrangement the whole outfit can be brought to the bank, by simply letting go of the mooring lines on the barge, and disconnecting two flexible pipe joints.

It is the writer's opinion that this is a step in the right direction. The next logical step would be to make swivel connections on the pontoons which will permit them to adjust themselves to the current. Of course where snags or islands occur below the barge, this system may require modification.

Today very few waste flumes are carried out across a channel, but only two years ago it was necessary for several plants to use this arrangement. In such cases the bents under the flumes, and the same applies to fuel and power lines, should always be placed on floats, even if these rest high and dry on sand bars. These floats should then be arranged to swivel about a certain point so that when floated off by a rise in the river the entire flume will swing into shore. Not only will this save great quantities of material but it will aid in establishing better public relations. Much of the widespread predjudice against sand companies is caused by fear that in time of flood strings of pontoons, and sections of flume connected by cables, will lodge against bridge piers and by collecting drift cause a serious overflow in the stream.

Conclusions

It is believed that enough has been said to give a fair picture of operating conditions and problems on the western rivers. The reader, if he has long experience, can remember when plants in the East and in the Ohio Valley worked under more or less similar conditions and struggled with similar problems. Much of the western development is simply a repetition of events which long ago occurred in the East. A very marked similarity is to be seen in the increasing production, the increased demand for high quality products, the decrease in the number of plants and producers, and the increased capital investment, efficiency and capacity of individual plants. On the other hand nature has decreed that in certain matters the West cannot follow the East, but must solve its own problems. The rivers are shallower and less uniform in flow. The gravels have different characteristics and the market is not entirely similar. The full exploitation of these deposits involves the development of much that is new in plant layout, in equipment and in operating technique.

(To be continued)

Flotation of Phosphate Rock

THE RECOVERY of phosphate rock and its separation from clay and sand has always been by taking advantage of differences in particle size. Recent improvements (especially the substitution of classifiers for screens in separating the fine material) have increased recovery in that way until it is thought that the limit has been reached. Increased recovery will depend upon the application of some other principle, as by flotation.

This is in effect the opinion expressed in Report of Investigations No. 3105 of the U. S. Bureau of Mines, Department of Commerce, headed "The Flotation of Low Grade Phosphate Ores." The authors are H. M. Lawrence and E. Roca. This paper says that flotation of phosphate rock has been studied for several years by the International Agricultural Corp. and its subsidiary, the Phosphate Recovery Corp. It perfected its process in 1927, according to a letter quoted in the paper. In 1929, independent investigation was undertaken at the University of Alabama, in which the U. S. Bureau of Mines cooperated, and this led to the present report.

The process developed consists of a conditioning of the phosphate by a sodium sulphide solution and flotation with oleic acid as a reagent. Sodium carbonate proved fairly effective in the place of the sulphide, but the hydroxide and the silicate of soda gave lower recoveries. Soaps in powder or chip form gave a fairly satisfactory separation in the place of oleic acid, but sodium stearate and some other combinations were ineffective unless combined with oleic acid.

The alkalinity of the pulp was found important, best results being with a pH value of 7.4 to 8.0. Water had to be conserved to prevent loss of reagents.

Tests were made on ground and unground (but passing 20-mesh) material. A test on ground material gave:

	Weight %	B.p.l. %	Insol. %	Recovery %
Feed	100	49.2	40.6	.....
Concentrates	57	71.0	2.7	94.4
Tails	43	5.7	90.7	.....

The results from an unground material test were:

	Weight %	B.p.l. %	Insol. %	Recovery %
Feed	100.0	15.5	79.3	.....
Concentrates	19.2	70.4	6.4	87.4
Tailings	80.2	2.4	96.6	.....

Satisfactory results were obtained in all tests where the material was finer than 35-mesh.

In some tests the cost of reagents was as low as 10c. per ton compared with 25-35c. for combinations previously developed.

Added Recovery of Phosphate Rock by Classification

THE OPERATION of five hydraulic classifiers in three plants of the Florida land-pebble phosphate field has increased the yearly production of the district 81,000 tons. At one plant the increase in production was 15%. The figures are from a paper, "Added Recovery by Hydraulic Sizing of Fine Material in the Land-Pebble Phosphate District of Florida," by R. G. O'Meara, assistant metallurgist of the U. S. Bureau of Mines, Department of Commerce, this being Report of Investigations No. 3139.

The description of the classifiers used is rather meager, but in its manner of discharge and some other features it seems to resemble the Richards-Janney classifier. It is a V-trough, 13 ft. long, 16 in. wide at the feed end and 32 in. wide at the discharge end. It is divided into six compartments by partitions 32 in. high. The sides and ends are 54 in. high. The actual classifying feature is of the constriction plate type, the openings in the plate being ¼-in. diameter and set on the corners of a 2-in. square. The spigots, which are 1¼-in. diameter, are opened intermittently by a mechanical device. The hydraulic water is 430 g.p.m.

Practically all the feed passes 8-mesh and very little of it passes 100-mesh. The coarse material in the feed is largely phosphate rock and the fine material is largely quartz. Since these are of nearly the same specific gravity they cannot be easily separated by concentrating tables and like devices. Recovery is therefore a matter of sizing, and for this 20-mesh screens were formerly employed but the classifiers do better work and cost less to maintain.

From 25 to 40% of the material fed to the classifiers is recovered as a marketable product. From the tables in the paper showing the results from all three washeries which have installed classifiers the following average figures are taken. The percentages are the content of bone phosphate of lime:

	Feed	Concentrates	Tailings
Washery No. 1	29.57%	63.38%	22.65%
Washery No. 2	38.55%	60.18%	34.06%
Washery No. 3	40.43%	65.00%	21.98%

The B.p.l. and insoluble contents of the classifier feed and six spigot discharges in No. 1 washery were:

	Bone phosphate of lime	Insoluble
Feed	41.54%	45.50%
No. 1 spigot	69.77%	11.14%
No. 2 spigot	64.55%	18.35%
No. 3 spigot	49.85%	35.23%
No. 4 spigot	33.90%	53.69%
No. 5 spigot	29.68%	61.49%
No. 6 spigot	30.18%	60.30%

Gypsum Production in Canada

GYPSUM PRODUCTION in Canada during March reached a total of 11,858 tons, an advance of 9.5% over the March, 1931, shipments of 10,828 tons, according to a report issued by the Dominion Bureau of Statistics at Ottawa. During the first quarter of 1932, Canadian producers reported a production of 23,074 tons, or 42.3% below the total for the corresponding period of 1931.

No crude gypsum has been exported from Canada during the past two months.

Imports of plaster of Paris, not calcined, into Canada amounted to 9 tons. Calcined plaster of Paris imports advanced to 228 tons.

Quarrying Limestone at Milltown Quarry of the Louisville Cement Company*

By H. D. Baylor†

THE Louisville Cement Co., Louisville, Ky., operates lime and commercial stone plants at Milltown, Ind., which is about 40 miles west of Louisville, Ky., on the Southern railroad. The lime plant has a daily capacity of 200 tons of lump and pebble lime.

Two mixed-feed kilns were built during 1885, and quarry operations were started with hand labor. Later two additional kilns were built. A commercial-stone crushing plant was erected in 1901 to take care of the stone that covered the limerock. The mining of limerock was begun in the following year and was continued until 1902. This property comprises the No. 1 plant (Fig. 1).

Additional land was purchased during 1902, on which the No. 2 plant (Figs. 1 and 2) was erected. The No. 2 plant consisted of two gas-fired vertical lime kilns, a hydrated lime plant, a commercial stone plant and a power house. In the same year the Eickel Stone and Lime Co. was purchased and called the No. 3 plant (Figs. 1 and 2). It consisted of three mixed-feed kilns, a quarry and a commercial-stone plant.

When the No. 2 and No. 3 plants were put in operation, No. 1 was abandoned.

All rock for the No. 2 plant was taken from the open quarry by hand loading until 1918, at which time the overlying stone became so heavy that it was necessary to obtain the limerock from the No. 3 mines (Figs. 1 and 2).

When the No. 2 commercial-stone plant was built a quarry was opened adjacent to the plant. The material was handled with a railroad-type steam shovel.

During 1928 a rotary-kiln plant was erected and designated as No. 4 plant (Fig. 1). The power house was abandoned in favor of central-station power. Two electric shovels with caterpillar trucks were purchased, one to replace the steam shovel and the other to be used in the lime quarry. At this time the mines were again abandoned and limerock was taken from the No. 2 quarry.

Geology

The stone in the Milltown quarries is of the lower carboniferous or Mississippian age and of the Mitchell formation. The Mitchell limestone is composed of compact limestones and chert, interbedded in places with beds of oolite and thin layers of limy shales. Its exposures occur over an irregular area, 3 to 25 miles in width, extending through the central part of southern Indiana, from the Ohio river in Harrison county, north and westward to the southwestern corner of Montgomery county, where they disappear beneath the glacial drift. The formation ranges from 250 to 350 ft. in thickness at the quarry.

The Mitchell formation varies much in structural character and appearance. In most places it is a fine-grained crystalline or subcrystalline stone which is quite hard. Near the top and betwen the beds of grayish stone, layers having an oolitic structure appear nearly pure white in color and much softer than the gray stone (Fig. 3). The chert occurs in varying quantities at different horizons in the gray stone. Often the chert nodules may increase in size and number from a few scattered pieces until they replace a greater part of the limestone. On weathered exposures the lime carbonate is bleached out and the chert fragments left in larger quantity than the residual limestone clay.

Both the oolite mentioned and the more common gray compact limestones (Fig. 3) are used to manufacture lime. The following table gives the chemical analysis of each:

	SiO_2	R_2O_3	$CaCO_3$	$MgCO_3$
Kittle ledge	1.40	0.39	96.32	1.88
Oolite	0.87	0.20	96.77	2.16

The bedding is horizontal, with a slight dip to the southwest. The beds are comparatively thin and are traversed by many open joints. Accordingly, the stone cannot be obtained in large pieces. These formations are typically cavernous and the ground surface bears the sink-hole type of topography.

Physical tests on the Mitchell limestone give the following data:

Specific gravity	2.66
Weight per cubic foot, lb.	165.3
Water absorbed, lb. per cu. ft.	0.46
French coefficient of wear	11.6
Hardness	10
Toughness	8

The Kittle ledge (Fig. 3) is the stone removed from the quarry described in this paper.

Methods of Prospecting and Exploration

Preliminary exploration in the area was accomplished by means of test pits and churn drills, but these means have been abandoned in favor of the diamond core drill. Test

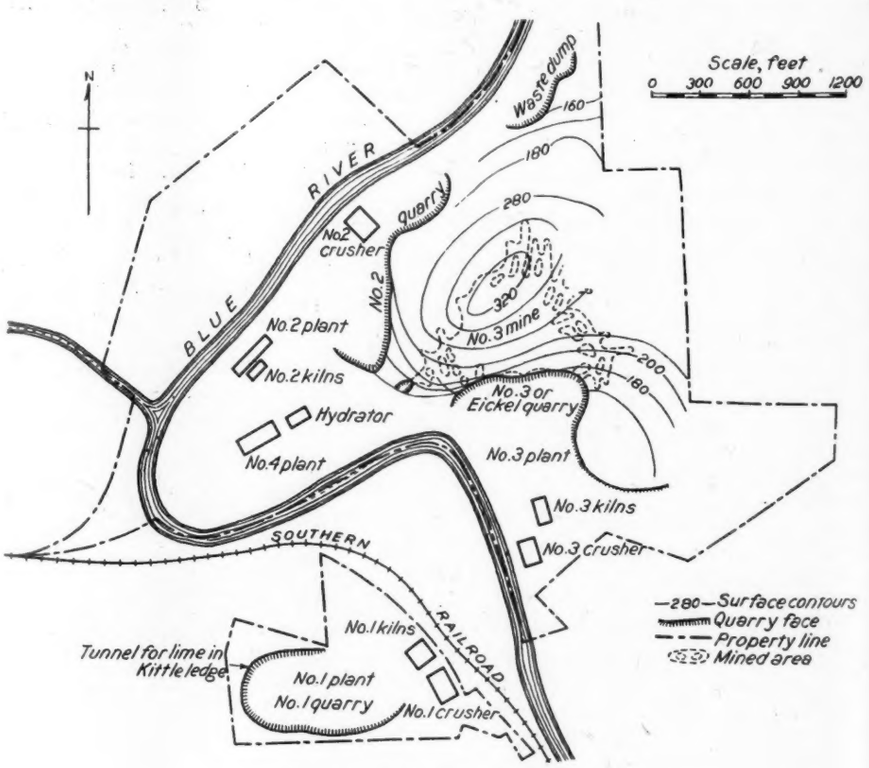


Fig. 1—Map of the property

*Abstract of U. S. Bureau of Mines Information Circular 6603. †Consulting engineer, U. S. Bureau of Mines, and vice-president, Louisville Cement Co.

pits were found to be much more expensive than core drilling and were not as informative. In the area tested the limestone is covered by 2 to 7 ft. of soil. Churn drills were found unsatisfactory in obtaining a knowledge of the character of the stone 75 ft. to 100 ft. below the top of the soil because with their use it was not possible to obtain sufficiently large pieces of the rock to ascertain its physical characteristics. In this instance also the churn drills available were the large, heavy type suited to drilling 6-in. blast holes. They were expensive to move. The core drill owned by the company was light and the two men who operated it could move it to any desired location with the aid of a team.

During 1928 considerable work was done with the core drill. The operating crew consisted of a driller and helper. Nine holes or a total of 564 ft. were drilled at an average cost of $2.48 per ft. for labor, $0.70 for supplies and $0.57 for carbon or diamond wear, totaling $3.75 per ft. An accurate record of the chemical analyses of the stone and log of the hole was kept by the laboratory and is shown for two typical holes in Tables 1 and 2.

Sampling

No sampling is done in the quarry unless the complete lime analysis on the burned lime from the kiln show the $CaCO_3$ below an average of 96%. From this lime analysis it is possible to tell whether the stone burned properly and whether its calcium carbonate content is up to the required standard. When this falls below standard the quarry is sampled by taking a grab sample from the rock broken ahead of the shovel.

Choice of Method

The amount of overburden covering the limerock determines whether this operation will be an open quarry or mine. Fig. 3 shows that the limerock is covered with 40 to 50 ft. of commercial stone. The deciding factor between underground mining and operating the open quarry is a matter of cost. If the overburden cannot be removed for less than 20c. per ton of rock uncovered, mining is preferable. From this it can be seen that if the overburden is of such character as to necessitate drilling and blasting, a thick overburden would compel mining. A high market price for limerock or a thicker seam would enable a thicker overburden to be removed economically.

If the overburden can be sold, instead of wasted, as much may be removed from the lime deposit as can be disposed of at a profit or at such a loss as would not create a charge of over $0.20 per ton of limerock uncovered. When the sale of commercial stone is of sufficient volume to keep the lime ledges uncovered, the open-pit method prevails in the lime quarries; when it falls behind, the limerock must be mined.

All quarries at Milltown have a natural drainage. The rough topography of the land also lends itself well to building waste dumps.

TABLE 1—CORE DRILL ANALYSIS

Milltown Commercial Stone Quarry, Drill Hole 2

Sample	Depth Ft.	Depth In.	Elevation Ft.	Elevation In.	SiO_2	R_2O_3	$CaCO_3$	$MgCO_3$
1	35	10	36	8	162	5	5.76	0.70	90.61	2.93
2	36	8	38	4	160	9	4.24	0.60	93.94	1.22
3	38	4	40	0	159	1	4.32	0.36	93.16	2.16
4	40	0	41	8	157	5	3.82	0.98	93.62	1.58
5	41	8	43	4	155	9	4.58	0.96	92.83	1.63
6	43	4	45	0	154	1	5.20	1.74	91.28	1.78
7	45	0	46	8	152	5	2.42	0.76	95.17	1.65
8	46	8	48	4	150	9	2.78	1.58	80.73	14.91
9	48	4	50	0	149	1	3.82	1.30	93.28	1.60
10	50	0	51	8	147	5	9.80	1.42	86.73	2.05
11	51	8	53	4	145	9	7.94	1.94	74.07	16.05
12	53	4	55	0	144	1	0.30	0.32	97.46	1.92
13	55	0	56	8	142	5	1.32	0.68	96.08	1.92
14	56	8	58	4	140	9	1.18	0.64	96.24	1.94
15	58	4	60	0	139	1	1.38	0.44	96.68	1.50
16	60	0	65	0	134	1	2.14	0.44	91.77	5.65
17 T	65	0	65	10	133	3	2.24	0.70	94.06	3.00
17 B	65	10	66	8	132	5	5.90	1.04	76.34	16.72

TABLE 2—CORE DRILL ANALYSIS

Milltown Commercial Stone Quarry, Drill Hole 3

Sample	Depth Ft.	Depth In.	Elevation Ft.	Elevation In.	SiO_2	R_2O_3	$CaCO_3$	$MgCO_3$
1	96	8	163	4	4.82	0.24	92.96	1.98
2	98	4	161	8	3.82	0.22	93.70	2.26
3	100	0	160	0	1.96	0.38	95.61	2.05
4	101	8	158	4	2.90	0.24	94.46	2.32
5	103	4	156	8	5.66	0.48	93.10	0.57
6	105	0	155	0	2.40	0.24	95.12	2.24
7	106	8	153	4	2.00	0.28	95.51	2.21
8	108	4	151	8	4.80	0.34	92.50	2.32
9	110	0	150	0	5.34	0.82	72.88	20.96
10	111	8	148	4	6.80	0.32	90.91	1.97
11	113	4	146	8	8.84	1.40	65.51	24.25
12	115	0	145	0	1.26	0.52	95.94	2.28
13	116	8	143	4	1.58	0.34	96.49	1.59
14	118	4	141	8	1.36	0.22	96.52	1.90
15	120	0	140	0	1.40	0.48	96.36	1.76

Quarrying Methods

STRIPPING—No stripping is charged against the operation of the limerock quarry with which this report deals. The commercial-stone quarry removes stone which lies directly above the limerock quarry; hence, the operation of the commercial quarry is in one sense a stripping operation for the limerock. Overburden capping the commercial stone is removed, and the cost of such stripping is charged to that quarry.

There is some cleaning up to do on the

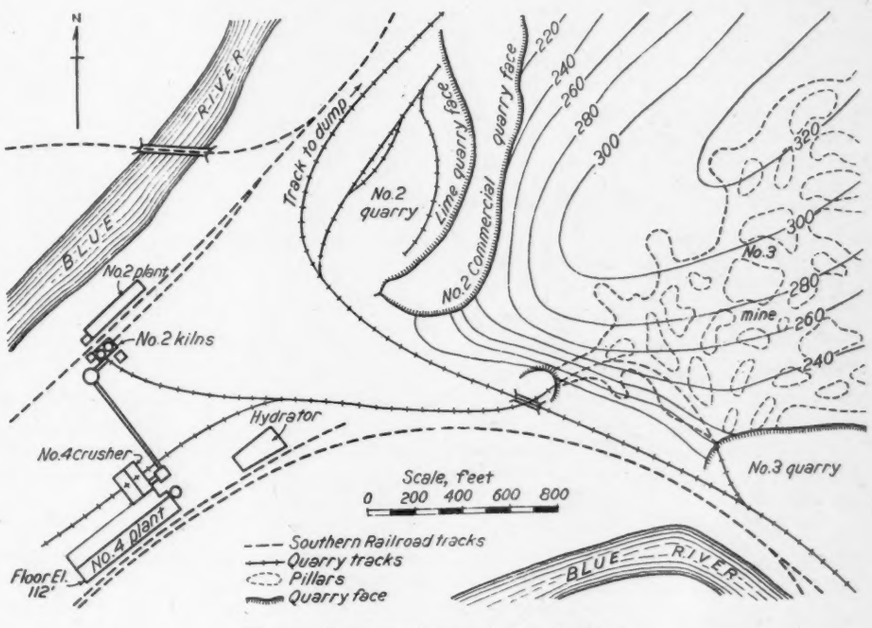


Fig. 2—Layout of quarries and plants

limerock, but this is small in amount and no record is kept of it.

DRILLING—The present lime quarry is worked in one 9-ft. bench. Preliminary and secondary drilling is done with jackhammer drills using 1-in. hexagon steel and 6-point star bits which are sharpened by hand.

Holes are drilled approximately 10 ft. deep, are 2 in. in diameter at the top and 1½ in. at the bottom. One man does all the drilling. The average drilling speed is 17 ft. per hour. Holes are spaced on 6-ft. centers and 6 ft. from the face of the ledge. Two lines of holes totaling from 20 to 30 are shot at one time.

Drilling costs are 12.33 c. per ft. of hole, and 2.72 tons of rock are obtained per foot of hole.

BLASTING—Forty per cent. dynamite in 1¼- by 8-in. cartridges and No. 8 electric detonators are used. The detonators are joined to a common lead wire and shots are made by closing a switch on a 220-volt power line.

For secondary shooting, of which little is done, 40% dynamite and No. 6 detonators with single-tape fuse are used.

The primary-blasting cost including labor, dynamite, etc., is 4.94 c. per ton. The secondary-blasting cost is 0.23 c. per ton. Ninety-six per cent. of the dynamite used is for preliminary shooting and 4% for secondary shooting. The total drilling and blasting cost is 9.90 c. per ton.

LOADING—All stone is loaded with a

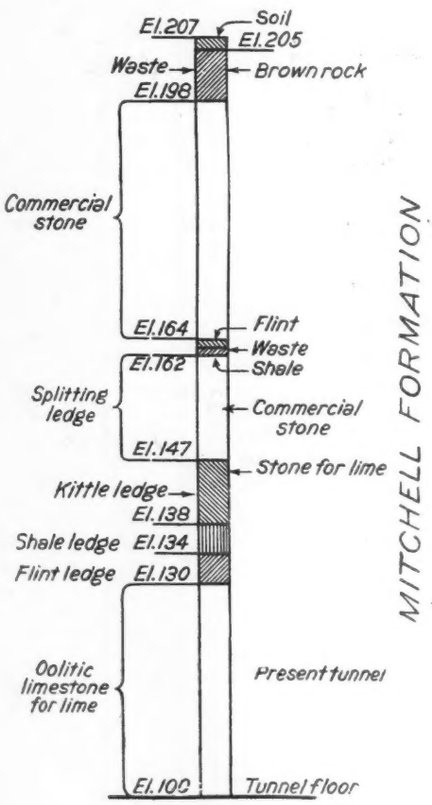


Fig. 3—Stratigraphic section of quarry

TABLE 3—COST PER TON OF LIMEROCK

Period covered, 1929. Tons produced, 47,187. Overburden, none.

	Labor	Supervision	Power	Explosives	Miscellaneous	Total
Drilling:						
Primary	0.0241	.....	0.0212	.....	.....	0.0453
Secondary	0.0011	.....	0.0009	.....	.....	0.0020
Blasting:						
Primary	0.0172	.....	.....	0.0322	.....	0.0494
Secondary	0.0007	.....	.....	0.0016	.....	0.0023
Loading	0.0260	.....	0.0072	.....	0.0047	0.0379
Transportation	0.0312	.....	.....	.....	0.0549	0.0861
Miscellaneous	0.0472	.....	.....	.....	.....	0.0472
Depreciation	.....	.....	.....	.....	0.0403	0.0403
Insurance	.....	.....	.....	.....	0.0031	0.0031
Miscellaneous overhead	.....	0.0196	.....	.....	0.0024	0.0220
Total quarry cost	0.1475	0.0196	0.0293	0.0338	0.1054	0.3356

TABLE 4—LIME-QUARRY COSTS IN UNITS OF LABOR, POWER AND SUPPLIES

Period covered, 1929. Tons produced, 47,187.

A. Labor:	
Drilling, man-hours per ton of stone	0.0406
Blasting, man-hours per ton of stone	0.0406
Loading, man-hours per ton of stone	0.0369
Haulage, man-hours per ton of stone	0.0812
Miscellaneous, man-hours per ton of stone	0.1069
Supervision, man-hours per ton of stone	0.0378
Total labor, man-hours per ton of stone	0.3440
Average tons per man per shift	29.06
Labor per cent. of quarry cost	49.6
B. Power supplies:	
Explosives, lb. per ton of stone	0.256
Total power, kw.-h. per ton of stone	2.05
1. Shovel, kw.-h. per ton of stone	0.50
2. Drills, kw-h. per ton of stone	1.55

TABLE 5—LIME-QUARRY AVERAGE COST, DIRECT OPERATION

Period covered, 1929.
Tons produced, 47,187.
Type of shovel, Marion Electric Type 7, caterpillar trucks.
Size dipper, 1 cu. yd.

	Cost per ton
Engineers	$0.0221
Total operating labor	$0.0221
Grease and lubricants	0.0009
Power	0.0072
Total supplies	$0.0081
Shovel and shop repair labor	0.0039
Repair supplies	0.0038
Total repairs	$0.0077
Total shovel operation	$0.0379

TABLE 6—SUMMARY OF LIME-QUARRY COSTS

Period covered, 1929.
Tons produced, 47,187.

	Cost per ton
Loading	$0.0379
Drilling:	
Operating labor	.0213
Air compressor, power	.0221
Repair labor	.0039
Total drilling	$0.0473
Blasting:	
Labor	$0.0179
Explosives	.0338
Total blasting	$0.0517
Haulage:	
Locomotive labor	$0.0312
Fuel and other supplies	.0549
Total haulage	$0.0861
General charges	.1126
Total cost per ton	$0.3356

TABLE 7—COST PER TON OF QUARRYING LIMEROCK

Period covered, 1929.
Tons produced, 47,187.

	Cost per ton
Operating labor	$0.0613
Repair labor	.0078
Operating supplies	.0038
Explosives	.0338
Power	.0293
Railroad and switching	.0861
Teaming	.0024
Depreciation	.0403
Insurance	.0031
Miscellaneous	.0677
Total cost	$0.3356

TABLE 8—EXPLOSIVES USED IN QUARRYING LIMEROCK

Production, tons, 47,187.0.
Explosives, pounds, 12,099.4.
Ratio: 1 pound of explosive gives 3.9 tons stone.
Ratio: Pounds of explosive per ton of stone, 0.256.

1-cu. yd., full-circle swing, electric shovel having caterpillar trucks. The shovel takes alternating current from the transmission line and converts it to direct current by a motor-generator set.

The loading crew consists of one shovel operator and two quarrymen who pick impurities from the limerock. The daily output of the shovel is 270 tons. The shovel is capable of a greater capacity, but is delayed because impurities must be picked from the stone.

TRANSPORTATION — All rock is transported to the plant by means of one 14-ton steam Vulcan locomotive hauling trains of five cars each.

The cars used are of 5 cu. yd. capacity, of steel construction, and are the 2-way rocker-dump type. When extra cars are needed, some 10-ton wooden cars are available. The

track is 60-lb. rail with a gage of 1 meter or 39.37 in., and the average haul is 3750 ft. from quarry face to crusher. There is one grade in favor of the loads of 5% for a length of 1200 ft. Tracks are shifted by the regular quarry crew as needed, this cost being charged to railroad and switching.

Crushing Plant

The crushing plant consists of a 48x36-in. jaw crusher driven at 19 r.p.m. by a 125-hp. motor through a Texrope drive. The average size of crusher feed is a 12-in. cube, and the discharge opening is 4½ in. The crusher discharges into an inclined elevator having 42- by 18- by 24-in. buckets moving at a rate of about 60 ft. per min. The elevator is set at an inclination of 63 deg. and is 63 ft. from c. to c. It is of double chain construction.

The elevator delivers to a 6- by 8-ft. bar grizzly with 1¼-in. openings between bars on a slope of 40 deg. The rock passing over the bar grizzly goes to a 10-in. gyratory reduction crusher set for 1½-in. discharge. This crusher is driven at 400 r.p.m. by a 75-hp. motor through a Texrope drive.

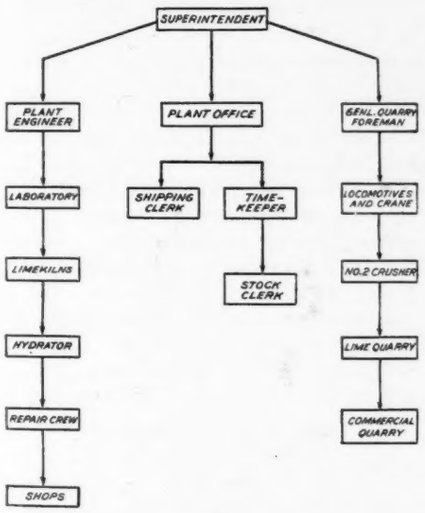


Fig. 4—Organization chart

Material passing the bar grizzly and reduction crusher drops to a vertical elevator using 24- by 12- by 18-in. buckets and operating at a speed of 85 ft. per min., and thence to a rotary screen. Rock slabs that will not pass a 1⅝-in. opening are returned to the reduction crusher. Rock passing the rotary screen goes into a storage bin. The rotary screen is used only to remove the oversize rock for recrushing; no attempt is made at sizing other than this.

The screen is 33 in. in diameter by 7 ft. long, is set on an inclination of 1⅜-in. to 12-in., revolves at 21 r.p.m. and is fitted with wire-screen cloth having 1⅝-in. square openings.

The power consumed in the crushing plant varies considerably at different outputs, ranging from 1 to 2.8 kw. h. per ton of material crushed.

Wage Scale

All wages are paid on an hourly basis in accordance with the following rates:

	Wage per hour
Foreman	$0.52
Shovel engineer	0.54
Powdermen	0.44
Driller and quarrymen	0.39½
Locomotive engineer	0.44
Brakeman	0.34½

Management

Fig. 4 is a chart showing the plant administrative organization. The lime-quarry foreman has charge of the drilling and blasting, loading of stone and transportation to the plant. He receives his instructions from the general quarry foreman.

Uses of Soapstone

THE EASE of workability is the most valuable characteristic of soapstone, states a report just made public by the Bureau of Mines. Its comparative softness and its massive uniformity combine to make it the most easily fabricated of all natural stones. It may be tongued, grooved, trimmed, or bored with ordinary wood-working tools. Regardless of these characteristics, however, soapstone has remarkable transverse and compressive strengths.

The chemical inertness of soapstone has led to its wide use for laboratory equipment and in acid and other chemical plants for vats, floors, etc. These applications consume only about 10% of the total volume of soapstone produced.

The use of the stone in dye plants depends upon its low absorption as well as its chemical inertness.

Soapstone is used for a variety of purposes in which the general adaptability of the stone is more important than its specific property of acid or alkali resistance. Among these uses are for photograph, blueprint, x-ray, and cardiagraph developing tanks; autopsy, mortuary, and mausoleum slabs, etc. One of the most extensive uses of block soapstone is for lining the smelting furnaces of sulphate (kraft) pulp mills.

The other common uses of soapstone are more dependent upon its physical properties than its chemical composition. Laundry tubs and kitchen sinks are the oldest representatives of this group. Within the past 10 years the laundry tub market has decreased until now it comprises only about 10% of the total volume of soapstone production. The increased use of soapstone in building construction during the past few years has more than offset the decline in laundry tub production, however, the greatest possibility for expansion of soapstone production is generally acknowledged to be through the increased use of the stone for various architectural purposes. In fact, at present soapstone logically should be included in any discussion of the dimension stone industry.

The high dielectric strength of soapstone, combined with its uniform texture, low absorption, freedom from metallic veins, resistance to flame action and high mechanical strength, makes it an especially desirable material for electrical insulation.

Until the last few years an appreciable part of soapstone production was utilized in the manufacture of griddles, fireless cookers, oven floors and grates, footwarmers, snow melters, and hearths. At present, however, more modern contrivances have supplanted most of these products although soapstone still is being used in large commercial traveling ovens and electrical fireless cookers.

When heated to a temperature of about 1800 deg. F. some grades of soapstone turn to a golden brown color and become so hard that they can not be scratched with an ordinary knife. Considerable research work has been done in attempts to utilize this property commercially in the production of floor tile or decorative stone for use where hardness and durability are important factors. Results obtained in using the material have been entirely satisfactory, but manufacture is difficult.

A modification of this same principle which apparently has possibilities is heating of soapstone dust, the resultant product to be used as an abrasive. Various grades and sizes could be produced. The process is patented, but no commercial utilization has been attempted.

Only an insignificant part of soapstone waste is now being utilized profitably.

The only outlet for waste soapstone of any appreciable size or importance is in pulverized form. Ground soapstone has been used for a variety of purposes in direct competition with other pulverized rock including the lower grades of talc. It does not compete with high-grade talc, especially for uses in which color is an important factor. At present the rubber and roofing trades are the largest consumers. It is used principally for dusting raw or processed material in various stages of manufacture to prevent sticking, although it is reported that some of it may be used as a filler.

The use of admixtures in concrete has attracted much attention during the past few years. Numerous products have been introduced, all of which claim increased workability and denser concrete as their principal advantages. Ground soapstone has been used successfully for this purpose, but no attempts have been made to promote its distribution on a large scale.

The manufacture of floor tile made of ground soapstone, sawdust, and portland cement, appears to be worthy of further research. This type of flooring is especially adaptable to industrial buildings.

New Use for Asbestos

AN ASBESTOS CLOTH, which is being used for awnings, is now being manufactured. The new product should add considerable volume to asbestos consumption.

Grinding Plant Research*

Part V—Tests of Coal Grinding Mills (Continued)

By William Gilbert
Wh.Sc., M. Inst. C. E., London, England

Test of Coal Grinding At I. C. Johnson's Works, Greenhithe, Kent

The plant consisted of a kominor, and a tube mill, which were used to grind coal for one 200 ft. wet process rotary kiln. The test is of especial interest, since the hp. per ton ground per hour, as referred to 15% on 180 mesh, was exceptionally low.

The mill dimensions and test results are shown in Table III, Line VI, and a diagram of the mills is given in Figs. 22 and 23.

Data on Kominor. The stepped lining plates were of the standard type. The grinding bodies were 24 cwt.† of steel balls, the average diameter being 3¼ in., and the average weight 7.8 lb.

The material left the end of the mill through four ports in the lining plates, 4¼ in. by 1¼ in. with a total area of 21¼ sq. in. Several other ports were closed off by plates (Fig. 22).

From F(2) in Part I the void volume is $\frac{24 \times 112}{663} = 4.05$ cu. ft. The material volume as measured was 4.70 cu. ft. Hence the ratio, material volume to void volume $= \frac{4.70 \times 100}{4.05} = 116\%$. The coarse screens had $\frac{3}{16}$ in. diam. holes. Fine screens were not used.

Data on Tube Mill. The lining plates were of cast iron, with longitudinal lifter bars 1-in. deep (Fig. 24). The flint stones used were taken from the wash mills, and at the time of the test a large quantity of scrap iron in small pieces had accumulated inside the mill. The charge consisted of 86.2 cwt.† of flints, ranging in size from 8 oz. to ½ oz., and 37.8 cwt.† of small iron scrap. The mill discharged through 72 slots, each 5 by ½ in., with a total area of 180 sq. in.

The charge volume as measured was 113 cu. ft. The flints, reckoned solid (at 162 lb. per cu. ft.) would occupy 59.5 cu. ft. and the iron reckoned solid (at 490 lb. per cu. ft.) would occupy 8.6 cu. ft., total 68.1 cu. ft. Hence the void volume was 113.0 — 68.1 = 44.9 cu. ft. The material volume, as measured, was 30.0 cu. ft. giving a ratio, material volume to void volume, of 67%.

Test Details

The material ground consisted of three parts of bituminous slack, and one part of anthracite duff. The percentage of ash in the mixture was 7.8, and the calorific value was 13,500 b.t.u. per lb.

The coal grinding plant was tested for one week with the kiln. Raw coal was weighed out in barrow loads of 2½ cwt.,† and then tipped to a set of crushing rolls in front of the coal dryer. The method of sampling was the same as for the Wouldham tests.

The dryer, rolls, kominor, tube mill, and elevators and conveyors in connection, were driven by a 100 hp. motor. The electrical horsepower supplied to the motor was observed at frequent intervals and the horsepower calculated for the kominor and the tube mill.

The material showed the following fineness:

(Per cent. of material remaining on sieve sizes)

Sieve size	Entering Kominor	Leaving Kominor	Leaving Tube Mill
½-in. sq.	3.1%	.....	.....
¼-in. sq.	13.7%	.....	.....
1/10-in. sq.	50.3%	.....	.....
100-mesh	.....	60.0%	2.0%
180-mesh	.....	72.0%	15.0%

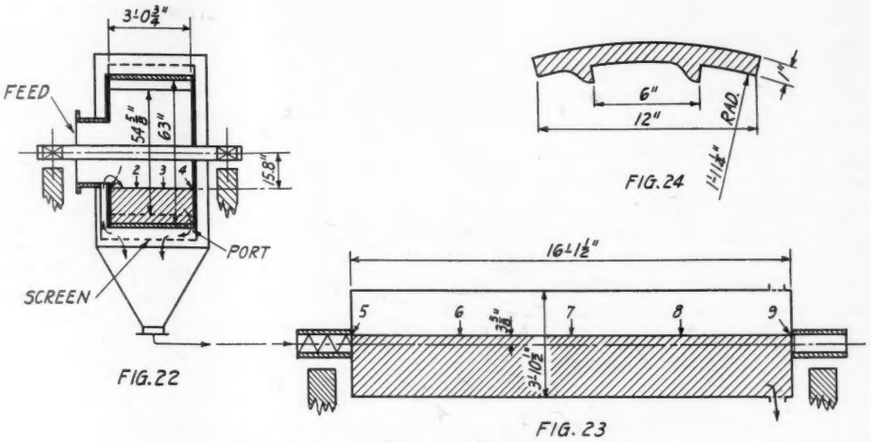
The following results were obtained:

Coal ground per hour, dry.....2.53 tons
Residue on 180 mesh.....15%
Power consumed per ton ground per hour .....20.3 hp.
Power consumed per ton ground per hour, referred to 15% on 180 mesh .....20.3 hp.

Axial Sieve Test

The result of an axial sieve test on both mills is shown in Fig. 25. The hp. per ton ground per hour for each mill can be obtained from Line VI in Table III. The coal entering the kominor had a residue of 95% on 180 mesh, and the coal leaving the tube mill had a residue of 15% on 180 mesh, hence the reference line, *ACB*, obtained from Fig. 16, is drawn through these points.

The curve *DE* shows the result of the axial sieve test, on the kominor, each of the four samples being taken from the interior



Details of coal mills at Greenhithe works

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†112 lb., based on English ton of 2240 lb.

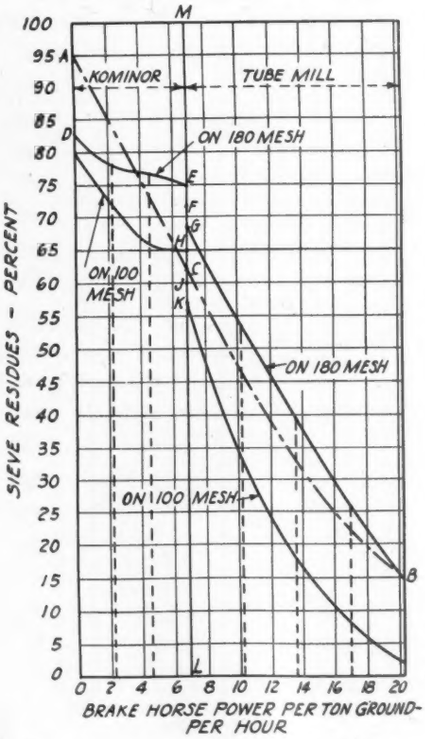


Fig. 25. Graph of tests at Greenhithe works

of the mill at points marked 1 to 4 in Fig. 22. Point F represents the residue on 180 mesh, as averaged from hourly samples of the material leaving the kominor. Measurements were made of the quantity of material which was returned to the kominor feed inlet opening from the screens, and it was found that for each 100 parts of new feed there were 13 additional parts entering as rejections from the screens.

The samples at E in Fig. 25 (or position 4 in Fig. 22) therefore, consisted of 113 parts, of which we will suppose that a parts would not pass the 180-mesh sieve. Since the residue at E was measured as 74.8% we may write $100\ \frac{a}{113} = 74.8$, from which $a = 84.5$. At the kominor outlet a is diminished by the 13 parts which are returned to the mill, and 100 parts leave the kominor, so that the residue on 180 mesh, as sampled at the mill outlet will be $\frac{100\ (84.5 - 13.0)}{100} = 71.5\%$.

The average sample leaving the kominor was 72.0% residue on 180 mesh as indicated at point F, so that the agreement is quite good.

Similarly, sample D, which was taken at position 1 just inside the kominor, when sifted had a residue of 82.7% on 180 mesh, but corrected for the screen rejections the actual value is 80.5%. It will be seen, therefore, that the coal disintegrated considerably as it entered the mill, and that the kominor did not do much further grinding. This may have been partly due to the large size of the balls used.

The point G (on Fig. 25) where the residue on 180 mesh is 68.8%, refers to a sample taken close to the feed end plate of the tube mill (see position 5 on Fig. 23). The tube mill is situated about 100 ft. from the kominor, and a spiral conveyor is used to convey the grit coal from one mill to the other. This may account for the distance apart of the points F and G.

Similar remarks apply to the curves dealing with the residues in the 100-mesh sieve. Corrected for the return from the sieves the point H is found to nearly coincide with point J, which represents the residue on 100 mesh as obtained from the average of the hourly samples of the material leaving the mill.

The reference line intersects the dividing line LM, between the kominor and the tube mill, at point C, which is below point F, hence in this case the kominor, including the initial disintegration, is apparently less efficient than the tube mill.

The tube mill had a high efficiency, but the reason is not apparent. The lining plates were provided with an efficient set of lifter bars and the speed constant, 168 (see Col. 20 and Line VI of Table III) was suitable for a tube mill with lifter bars. The ratio of the material volume to the void volume was 67%, which is quite normal.

The presence of a large quantity of small pieces of iron amongst the flint stones was found to give very good results in the test of a tube mill for coal grinding, at the Coles Shadbolt Works, Harefield, but this test has not been included owing to the difficulty experienced in measuring correctly the b.h.p. used by the mills which were driven by ropes from gas engines through a countershaft.

The tube mill (Fig. 23) was filled up to 3⅝ in. above the center line, or a charge volume of 60%. During the experimental mill trials (to be described later), charges of 40, 30 and 20% were tried out, and the grinding efficiency was not very different in the three cases, provided that the mill was operated at the speed suitable for each charge. A charge volume of 60% was, however, not tried.

When the test was made at I. C. Johnson's Works the writer put down the good performance of the tube mill to the lifter bars, and the lining plates of the experimental mill, which was installed later, were

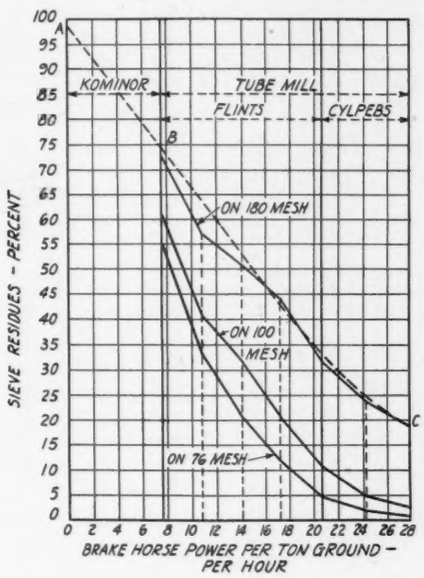


Fig. 26. Graph of tests at Wilmington works

provided with lifter bars. The experiments which followed, however, showed that smooth lining plates were equally efficient, if the mill was run at a somewhat higher speed.

The coal may have been exceptionally easy to grind, but as a hardness standard was not in use when the test was made, it is not possible to deal further with this point.

Test of Coal Grinding Mill for Kilns I and II at Wilmington, Hull

This test was made on a kominor and tube mill, which were used to supply pulverized coal to two 100 ft. wet process rotary kilns. The mill dimensions and test results are shown in Line VII, Table III, and the mills are similar to those indicated by Figs. 18 and 19.

Data on Kominor. The stepped lining plates were of standard design. The charge consisted of 18 cwt.† of steel balls, ranging in size from 2⅞ to 3⅞ in. in diam., and in weight from 3.6 to 8.7 lb. There were ten discharge ports through the lining plates, at the end of the mill, but only one in use.

There was an exceptionally large quantity of material in the mill, due probably to the reduced port opening. By F(2) in Part I the volume of the voids is $\frac{W}{663} = \frac{18 \times 112}{663} = 3.04$ cu. ft. The volume of the material in the kominor was 9.32 cu. ft., hence the ratio of the material volume to the void volume was $\frac{9.32 \times 100}{3.04} = 307\%$.

The coarse screens had $\frac{3}{16}$-in. diam. holes and the fine screens were 16 mesh. They were considered to be too fine, and a 4 in. square hole had been cut in one sieve. Probably the grinding effect of the kominor was low owing to the large quantity of material in it.

Tube Mill, Flint Stone Compartment. The lining was of silex blocks. The charge consisted of 53.0 cwt.† of flints, the average weight being 3.7 oz.

The compartment delivered through a diaphragm plate similar to that marked AB on Fig.19. The plate contained 208 slots, 3⅞ by 5/16 in., the total area being 252 sq. in.

Tube Mill, Cylpeb Compartment. The lining was of silex blocks. The charge consisted of 23.75 cwt.† of cylpebs, which were approximately ⅝-in. diam. by 1⅜ in. long, with an average weight of 1.9 oz. The compartment delivered through a diaphragm plate similar to that marked CD on Fig. 19, and finally by periphery ports. The plate contained 208 slots, 3¾ in. by ⅛ in. with a total area of 97 sq. in. They were, however, choked with pieces of iron, leaving about 25% of the area available.

Test Details

The coal was bituminous slack with 10.9% ash and a calorific value of 13,576 b.t.u. per lb. The coal grinding mill was tested for one week with the kilns. The methods of sampling and the estimation of the running time of the kominor and tube mill were practically the same as for the test at Wouldham.

The kominor and tube mill were driven by an 80 hp. motor and the horsepower for each mill was estimated in the same manner as for the test at Wouldham.

The material showed the following fineness:

(Per cent. of material remaining on sieve sizes)

Sieve size	Entering Kominor	Leaving Kominor	Leaving Tube Mill
1-in. sq.	5.0%	.....	.....
½-in. sq.	38.0%	.....	.....
¼-in. sq.	61.0%	.....	.....
76-mesh	.....	55.0%	.....
100-mesh	.....	61.3%	2.7%
180-mesh	.....	73.5%	19.0%

The following results were obtained:

Coal ground per hour, dry.....1.59 tons
Residue on 180 mesh.....19.0%
Power consumed per ton ground per hour .....27.8 hp.
Power consumed per ton per hour, referred to 15% on 180 mesh.....30.5 hp.

Axial Sieve Test

Particulars of the axial sieve test on the tube mill are given in Fig. 26. The data necessary for obtaining the b.h.p. per ton ground per hour for each mill (as well as the data required for dividing up the tube mill b.h.p. between the flint stone compartment and the cylpeb compartment) can be obtained from Line VII in Table III, Part III. *ABC* is the reference line, as obtained from Fig. 16.

If the reference line, which was obtained by grinding standard sand, is accepted as applicable, it will be seen that the efficiencies of the kominor, and the two compartments of the tube mill were nearly alike, but the extent to which the coal disintegrated on entering the kominor is not known.

The test result (which was 30.5 b.h.p. per ton ground per hour, when referred to a residue of 15% on 180 mesh) was quite good. It is better than that obtained from the more modern coal grinding plant used in connection with Earle's Kiln III (see Line V of Table III). The class of coal ground was substantially the same in each case.

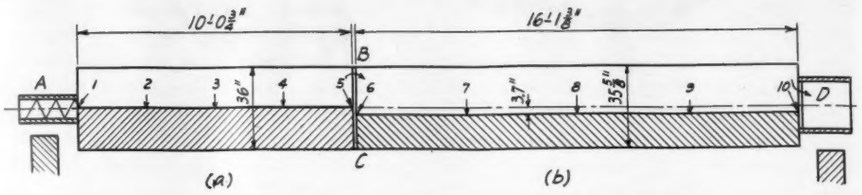


Fig. 27. Details of coal mill at Wilmington works

Here again it is not possible to say definitely to what factors the good result is due. The tube mill, in line VII, is of less diameter than that in line V, and this may have a bearing on the subject. Its speed, however, was exceptionally low.

Test of Coal Grinding Plant at Shoreham Works of British Portland Cement Manufacturers

At this works a compound tube mill was used to supply pulverized coal to one wet process rotary kiln 164 ft. long. The mill dimensions and test details are shown in line VIII of Table III, and a diagram of the mill is given in Fig. 27.

Preliminary Chamber of Mill, (a). The chamber was lined with smooth cast iron blocks, 9x4¼x1⅛ in., which were set in diamond cement. The charge consists of 85.5 cwt.† of steel balls, the average diameter being 1⅞ in., and the average weight 1 lb. The compartment discharged through a diaphragm plate marked *BC* on Fig. 27. A detail of the plate is shown on Fig. 28. The slots were 11/32 in. wide on the inlet side, the total area being 172 sq. in. About 80% of the area through the slots was, however, choked by pieces of iron.

By F(2) in Part I the void volume was $\frac{85.5 \times 112}{663} = 14.4$ cu. ft. The material volume as measured, was 16.4 cu. ft., hence the ratio of the material volume to the void volume was $\frac{16.4 \times 100}{14.4} = 114\%$. The feed to the mill was supplied through a journal 12 in. in diameter, and 15 in. long, marked *A* on Fig. 27.

Finishing Chamber of Mill, (b). The lining was similar to that of the preliminary chamber. The charge consisted of 108.5 cwt.† of cylpebs. They were generally ¾ in. in diameter, and 1¾ in. long with well rounded ends.

The mill delivered through a journal 24½ in. in diameter by 11⅝ in. long, marked *D* on Fig. 27. The hole through the journal was protected by the grid shown on Fig. 29. The slots are 5/16 in. to ⅜ in. wide, the total area being 85 sq. in. The outlet grid was practically clear.

By F(4) in Part I the void volume was $\frac{108.5 \times 112}{650} = 18.7$ cu. ft. The material volume as measured was 14.1 cu. ft., hence the ratio of material to voids was 75.5%.

Test Details

The coal ground was 3 parts of bituminous slack and 1 part of anthracite duff. The ash content was 19.6%, and the calorific value was 11,970 b.t.u. per lb.

The coal mill was tested for 8 days with the kiln. The raw coal was weighed out in barrow loads of 2 cwt.,† and tipped to the coal dryer elevator, a sample being taken from each barrow for moisture determination. The method of sampling for the sieve tests was generally similar to that used at Wouldham.

The number of revolutions made by the mill was recorded by a reciprocating counter, and the running time was found by dividing the counter reading by the average r.p.m.

The mill was belt driven by a motor and power measurements were taken hourly throughout the test. The horsepower supplied to the mill was calculated, a suitable allowance being made for the motor losses.

The average results can be obtained from the graph Fig. 30. The residues for the coal

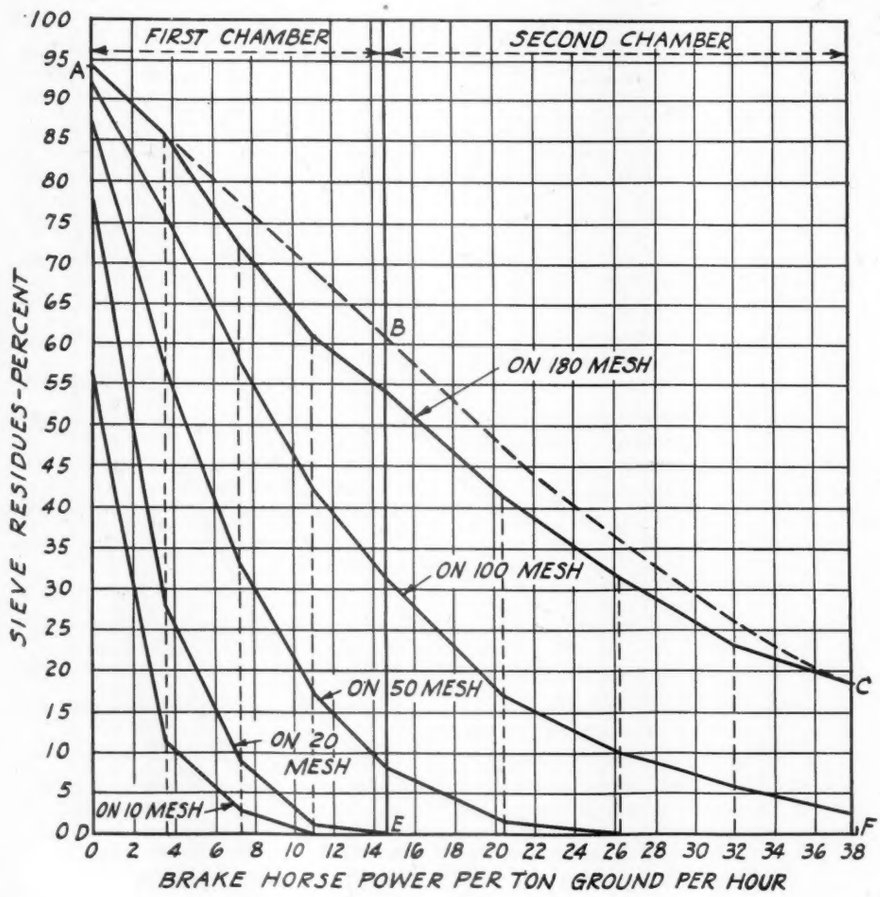


Fig. 30. Graph of tests at Shoreham works

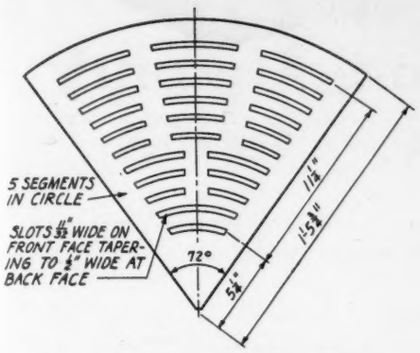


Fig. 28. Outlet plate of preliminary compartment

feed are given on the ordinate *DA*, leaving the preliminary chamber they are given on *EB*, and leaving the finishing chamber the residues are given on *FC*.

The following results were obtained:

Coal ground per hour, dry.....1.85 tons
Residue on 180 mesh.....18.6%
Power consumed per ton ground per hour .....37.8 hp.
Power consumed per ton per hour, referred to 15% on 180 mesh.....41.1 hp.

Axial Sieve Test

The compound tube mill took 70 b.h.p. This amount is divided between the two chambers in accordance with F(8)A in Part I, suitable data being obtainable from Line VIII in Table III. The coal entering the preliminary chamber had a residue of 94.5% on 180 mesh, and the reference curve *ABC*

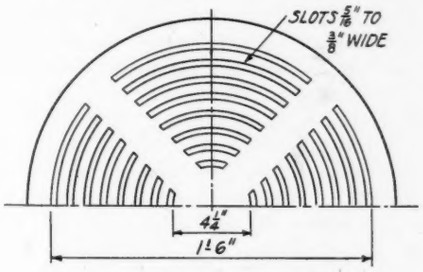


Fig. 29. Outlet plate of finishing compartment

is drawn through this point, and point *C*, which represents the terminal residue. The samples were taken in the positions marked 1 to 10 in Fig. 27.

Apparently there was little or no disintegration of the coal as it entered the preliminary chamber. Assuming the coal to have been of uniform hardness throughout the range it will be seen that the preliminary chamber was somewhat more efficient than the finishing chamber but actually this result is doubtful.

Second Test. It will be seen that the area through the diaphragm plate, *BC*, between the two chambers, was 172 sq. in., but about 80% of the slot area was closed by small pieces of iron.

From Table III, Line VIII, col. 17, it will be seen that the ratio of the material volume to the void volume, in the first chamber, was 114%.

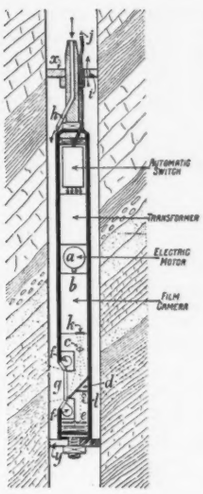
The slots in the diaphragm plate were cleared, and a further test of 8 hours was made. The result was, however, slightly worse than before, the output being 1.81 tons of dry coal per hour, ground to a residue of 20.1% on 180 mesh.

(To be continued)

A Borehole Camera

A BOREHOLE CAMERA developed by Dr. Thomas Reinhold, of Heemstede, Holland, was described in a recent issue of *Mining and Metallurgy*. The camera has been used by the Netherlands Geological Survey in a search for water and it is suggested as suitable in oil drilling work or for geological exploration.

In geologic work the camera would show whether a strata was homogeneous or a series of bedded planes. In drilling limestone ledges, pockets or caverns are often encountered which lead to difficulties as to amount of explosives to use, method of tamping, etc. A camera of this nature should be an invaluable aid in this regard. The device would also give the dip or inclination of strata and would check results obtained in core drill work.



The illustration shows the construction of the apparatus. Two electric lamps, *f*, illuminate that part of the wall to be photographed, the reflected light being directed by the mirror *d*, to the lens *c*, and thence to the film *k*, which is contained in the camera located in the chamber *b*. The glass window *g* protects the interior of the instrument from the water, mud, or oil in the well. An electric motor *a* changes the film after each exposure, being provided with current from a transformer, and operated by an automatic switch. Electricity may be led in by a cable *j*, from the surface, say at 220 volts, or by a battery contained in the instrument itself. Below the mirror *d*, is a compass disk *e* (illuminated by the lamp *l*) which is photographed simultaneously with the wall, the rays passing beside the mirror. In this manner, the orientation of the picture is recorded on the film itself.

The section of the borehole being photographed is isolated by the packing rings *x* and *y*. By changing these rings the instrument may be used in boreholes from 5½ to 12 in. in diameter. Clear water is admitted to this section through the tube *h*, the muddy water being forced out through the opening *i*. In the presence of oil, benzine or gasoline may be used for washing the hole. By raising and lowering the instrument slightly, the packing rings will brush the walls clean.

In operation, the apparatus is attached to the drill rods and lowered to the desired depth. After washing the section of the hole, the light is switched on and the exposure made. Turning the instrument around permits the entire circumference to be taken in a few pictures. By raising or lowering the instrument, any desired number of sections of the borehole may be photographed. Enough film is contained in the camera to make several hundred exposures.

Leather Belting Now Sold by Thickness

THE AMERICAN Leather Belting Association has decided that for the greater protection of the consumers of leather belting it should establish and sell this commodity by specifications of thickness instead of weight, thereby discarding the old weight terminology of "ounces per square foot," which may be varied by the mere addition of weighting materials to the leather, and does not necessarily always represent a differential in transmission values. The movement is said to have the endorsement of practically the entire industry.

This is a move to establish higher standards for leather belting, the association states. Inasmuch as leather belting prices are based on thickness, it is claimed that this change has met with the instant approval of both manufacturers and users of leather belting. It simplifies and makes comparatively easy the checking of each piece of belting to see if the average thickness is as ordered.

The thickness specifications now in effect for first quality leather belting are as follows: Medium single, 10/64- to 12/64-in.; heavy single, 12/64- to 14/64-in.; light double, 15/64- to 17/64-in.; medium double, 18/64- to 20/64-in.; and heavy double, 21/64- to 23/64-in.

All thicknesses in this table are average thicknesses in inches, as determined from 20 coils. In rolls containing less than 20 coils the average thickness should be determined from one-half of the total number of coils.

The classification of "light single" has been eliminated entirely.

Directory of Commodity Specifications

THE NEW EDITION of the National Directory of Commodity Specifications has been issued by the Bureau of Standards. The book contains, by title, designating number and sponsoring organization, standards and methods of test for all commodities regularly produced in the United States. Each specification is also briefly summarized as to technical characteristics, scope and special applications.

Practical Methods for Testing Masonry Mortar Cements

By F. O. Anderegg

Consulting Specialist on Building Materials, Fulton Building, Pittsburgh, Penn.

Synopsis

SINCE tensile and compressive strengths give inadequate information about the properties important in masonry cements, a set of tests has been developed which can be made conveniently and from which the worth while properties in a masonry cement can all be evaluated.

—The Author.

THE PRESENT LACK of adequate standards for or methods of testing masonry cements is becoming a matter of some concern to those interested in the quality of masonry work.

Some of the mortars in actual use could have been replaced by clay from the excavation without hurting their quality. Other mortars made of straight portland cement and sand have an excess of certain properties but lack others desirable for the best results in masonry.* A proper balance is needed between strength and weather resistance on the one hand and workability and flexibility on the other.

While the correlation between tensile tests made with standard Ottawa sand and the behavior of masonry cements under exposure is good in many cases, certain cements have been encountered that gave with standard Ottawa sand very acceptable strengths; whereas, both with commercial and with ideally graded sand, much lower relative results were obtained and much more in accord with the resistance actually shown to the weather.

If it is desired to compare results of different laboratories, the Ottawa sand does have, of course, the advantage of uniformity. At present there is no source of graded sand, although there is real need for such a sand. Therefore the tests have to be made with the local sand available for the particular job under consideration.

Comparative Tests for Masonry Cements

A set of tests, mostly new, has been developed to aid in evaluating those properties which have been shown to be of importance in masonry cements. Certain limitations have been imposed by the present state of our knowledge. For instance the phenomena covered under the term, "workability," are so complicated that attempts to get some quantitative idea by means of a flow table or flow trough, or other similar methods are nearly worthless in telling how a mortar will behave under the trowel.

The development of these tests was started during the brick masonry investigation at Mellon Institute, after the inadequacy of trying to correlate laboratory methods made by orthodox methods with the behavior of the mortars under the trowel and in contact with masonry units.

To a person used to the usual tests, the ones proposed here may seem to be so different as to warrant little consideration. These methods have, however, been applied to some 40 cements and in every case a very good idea has been obtained as to their behavior in actual construction. It is, therefore, recommended that these methods be used provisionally till a better set can be devised.

Test Procedure

I. WORKABILITY—Determine the weight of a bag of the cement and weigh out about 10 lb. (25 lb. if a panel is to be built of III) and mix with it 20 to 25 lb. (40 lb. should be weighed out) of the sand being considered for the job, or typical of the locality. The unit weight of the sand should be known in the loose damp condition as used on the job, as well as when dry-rodded. The amount of absorption of the sand and the amount of excess water found in the sand as used should also be determined. Three quarts of water are then added and as much more as is needed to bring to the brick-laying consistency range, as judged by the mason.

Lacking any quantitative measure of workability that is anywhere near satisfactory, a qualitative test has been found useful and the best way of doing this, according to the experience of the writer, is to select a mason having a flexible wrist and keen observing power. Then let the cement tester, after he gets used to the practical workability needs, check the mason at every step.

The next point is to determine the *sand carrying capacity* according to the judgment of the mason. This can be checked usually within reasonable limits by repeated trial. As the sand is added, of course, more water is needed. The excess sand left from the original is weighed and the sand-carrying capacity in terms of volumes is calculated. If it is desired, the mortar yield may now be obtained by weighing a suitable volume, say a quarter of a cubic foot.

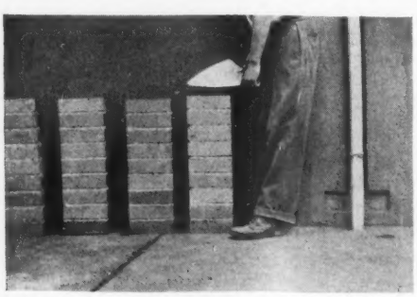
The mortar should stand at least half an hour and is then loosened by a little working (water being added as needed) and the mason proceeds to compare the several mortars as to ease of spreading, spotting and buttering. For this purpose brick should be used which will absorb from 1% to 2% of their weight in 10 min. when placed flat side down in ¼-in. of water. If the brick are more porous the absorption may first be reduced to the required value by preliminary soaking, as determined by trial.

Note 1: "Spotting" is the transferring of a small amount of mortar from the trowel to the end of the brick at one side with a single, rapid movement. The mortar should remain adhering without application of excessive pressure.

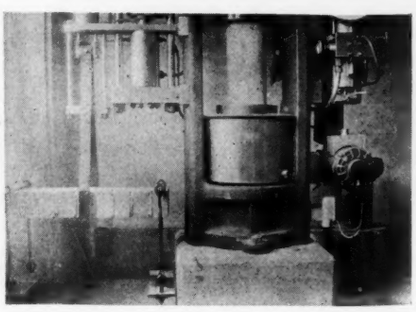
Note 2: The operation of "buttering" consists of rubbing the trowel flatwise over a small amount of mortar at the edge of the mortar pile so that the mortar remains adhering to the bottom of the trowel. The mortar is then spread at the long edges on the flat surface of a brick in a thin layer so as to give a very tight joint. The sand must not be too coarse for this test.

II. ADHESION TO THE MASONRY

*See article by same author "Analysis of Properties Desired in Masonry Cements," ROCK PRODUCTS, December 5, 1931.



Brick beams prepared for determination of bond strength



Brick beam being broken in flexure

UNITS—Since the weakest place in the wall is the bond between the brick and mortar it should be tested by building two or three beams seven or nine brick high. The brick should have at the time of the test a 10-min. absorption rate of from 1% to 2%. They should be wire cut and be free from holes.

The mortar used in the workability tests should be spread evenly to a depth of half an inch. A brick is placed on top and lined with the trowel and then given three sharp blows with the edge of the trowel, falling through about 2 in. The excess mortar is scraped off but the joint must not receive further troweling. The beam should not be disturbed after it has been made until the mortar is well hardened. If the beam is made in the laboratory it should be superficially sprinkled from a sprinkling can five times a week. The beam is broken in flexure at 28 days, dry and with central loading.

The modulus of rupture should be at least 30 lb. per sq. in. as calculated from the formula,

$$\frac{3WL_2}{2bd}$$

where W is the load required for breaking, L is the length of the span, b is the width of the beam and d the depth. The character of the break, whether in the mortar or completely or only partially between the brick and the mortar, should be recorded. A clean brick surface often indicates an undesirable brittleness in the bond.

III. WATER-TIGHTNESS—The fragments of the beams after breaking, are covered on one side with canton flannel or other soft cloth which is kept saturated with water for 8 to 24 hours. An alternative method is to build a dam around the edge and impound water for an hour. Then after the surface is superficially wiped the beam is broken up and the penetration of the water through the mortar and especially between the brick and mortar is observed. The moisture should penetrate only a small distance.

A test that is more convincing and one that should be met by cements to be used in parapet walls, and other walls subject to severe exposure is to build a panel three brick wide, and ten high and one thick with the same workmanship as that to be used on the job. After curing for one week the panel may be sprayed using an ordinary

Weathering tests

Panel erected for spray test. This test by direct comparison with leaking walls has been found to be much too severe

lawn-hose nozzle, which is adjusted to spray the entire area of the panel. This requires about 15 lb. nozzle pressure.

The back of the panel should remain completely dry after half an hour of spraying. If moisture does come through examination of the mortar surface after breaking up the panel will indicate whether the trouble is due to poor workmanship or whether moisture is penetrating between the mortar and the brick through valley-like shrinkage depressions.

Note 1: If the brick are porous they may transmit moisture to wet the surface of the mortar so that it may be difficult to observe whether the moisture is passing through openings between the brick and the mortar; hence the face of the brick in contact with the water should be practically impervious.

Note 2: To avoid wetting of the back by spattered water it is desirable to cover the sides of the panels with boards and another board should be laid on top with a strip of waterproofed cloth which should hang down over and in close contact with the front surface for about 2 in.

IV. WEATHER RESISTANCE—A small amount of mortar, sufficient to form three slabs 1x6x6-in. is spread without undue compacting. After curing for seven days under damp cloth two slabs are placed on the roof or in similar exposed position for one year. It is well to observe the specimens about the beginning and end of Spring. (In Pittsburgh the observations are made late in March and early in May.)

The third specimen, after similar curing, followed by drying for five days, is placed under a small tube from which water drops from a height of 4 in. about once a minute. It is recommended that the water be acidulated with sulfuric acid to give a pH of 3.5 to 4, an acidity actually encountered in rain water by the writer. This test is carried out for one month or until satisfactory distinctions are developed among the mortars under comparison. The results from this test are to be compared with those obtained by exposure on the roof. The time required to detach the first sand grains should be noted; for cements of good quality more than one month is usually needed for this test, or longer than one year on the roof.

Another test giving evidence as to probable weather resistance is the determination of the absorption of samples of mortar taken from the broken brick beams. The difference between the air dried weight and that after soaking for 24 hours at 70 deg. F. divided by the dry weight, should not exceed 10%.

V. FLEXIBILITY—When the beams are broken, the deflection under load can be conveniently read with an Ames or similar dial supported from the center of a tripod. The flexibility of the mortar should be sufficient to allow the dial to record a movement of at least 0.003 in an 18-in. span before it breaks.

VI. SHRINKAGE AND SHRINKAGE RATE—The shrinkage rate of the mortar in contact with the masonry unit during the setting and hardening period is probably the most important of the volume changes. This may be conveniently followed by observing the behavior of the brick beams or walls with a suitably mounted telescope (cathetometer). After the mortar has hardened the effect of wetting the masonry can readily be followed. For measuring the latter a strain gage might also be used.

VII. COMPRESSIVE STRENGTH—Mortar used in the workability test is molded into 1-in. cube molds which should rest on brick having a 10-min. absorption from one to two per cent. Excess mortar is put on and another brick which is tapped in the same way as in building the brick beam. The excess mortar is struck off with the brick which is then left in contact with the mortar for 48 hours. The cubes are stored in water for five days, in the air of the laboratory for 21 days and then broken. They should require at least 1000 lb. for crushing.

While the compressive strength in most

Compression tests on mortar in 1-in. cube molds with mortar in contact with brick for 48 hours. The cubes are then stored 5 days in water and 21 days in the laboratory

mortars is sufficient to support the weight of the wall resting on it, when allowed sufficient time to reach strength, modern conditions of building, where as many as seven stories of brick work are laid up in a single week, demand a suitable acquirement of early strength. Hence the rate at which the mortar becomes capable of sustaining weight is of great practical importance because the falling of a freshly erected wall may endanger life, to say nothing of the possible property damage. To take care of this condition, the following test has been proposed:

The brick to be used on a given job should be cemented into pairs using the proposed mortar, mixed as it would be on the job. The thickness of the joint should be the same as specified and the workmanship (the degree of pounding and shoving) should correspond to that of the poorer type of craftsman to be employed. The temperature of materials should correspond to the lowest likely to be encountered.

The mortar joint should be able to sustain after standing for ½, 1, 2, 4 and 8 hours loads of at least 60, 125, 250, 500 and 1000 lb. respectively. This allows for the vertical erection at a rate of two feet per hour with a safety factor of two. If a higher factor is desired, a corresponding correction may readily be made. From the results an adequate idea is obtained as to safe speeds of erection under the given conditions.

Note 1: The 1-in. cubes are thicker than the bed of mortar in a masonry wall should ever be. Nevertheless, the difficulty of securing concordant results with smaller specimens leads to the use of this size unit. With 2-in. cubes, especially in metal molds, the conditions are so different from those in the wall that the results obtained with the larger unit may be deceiving.

VIII. EFFLORESCENCE—A slab similar to the one for observing weather resistance is made up and after storage under damp cloth for one day it is set on one end in a pan of distilled water ¼-in. deep. After one week the surface of the slab should be free from efflorescence.

Note 1: If there is any doubt about the sand it should be washed before making this test, or Ottawa sand could be used.

Note 2: The slab should be placed in a moderate draft so as to hasten the movement of water through it.

IX. FADING—Select a black pigment which is known to be practically free from efflorescence salts and add to the cement to the extent of about 10% or sufficient to produce a dark black color. Mix with sand and use in pasting two brick together. Allow to stand where the air is in moderate circulation and observe any fading in the mortar joint as compared with some of the mortar in contact with glass. The mortar should not fade appreciably. If a cooler analyzer is available the amount of light reflected should not be increased more than 5% over the sample in contact with the glass.

X. STAINING—Buff limestone is to be selected which will give a dark stain with 2% sodium carbonate solution, but none, or practically none, with distilled water. Neat cement paste is molded on top of a stone in the shape of a trough and immediately a canton flannel wick is placed in contact with the cement, the other end being in distilled water. After 24 hours the sides of the stone are examined for stain and again after drying out, in comparison with a stone free from cement but which has been in contact with the wet wick for 24 hours.

The stains developed should be but slightly more intense than that produced by distilled water.

Note: A cube of stone with an edge of about 4 in. is a convenient size for this test.

Mortar Color Pigments

If it is planned to use mortar color pigments they should be added to the mixes to be tested in the amounts required to give the color desired. This recommendation is made because of the marked modifications in the properties of mortars often produced by color pigments.

Experimental Results

A series of masonry cements has been tested at the Research Laboratory of the Medusa Portland Cement Co. according to the directions outlined above. Some of the results will be presented in a further communication.

Fuller's Earth Industry in 1931

THE FULLER'S EARTH industry in the United States in 1931, for the first time in ten years, retrogressed as compared with the preceding year. The fuller's earth sold or used by producers in 1931 was 288,400 short tons, valued at $3,055,570, or $10.59 per ton. This was a decrease of 47,244 tons, or 14% in quantity and $1,271,135, or 29% in value compared with 1930. This output, however, was larger than that of any year prior to 1929, and was 173% larger than that of 1921. The average value per ton in 1931 was the lowest since 1916; it was 18% lower than that of 1930 and 46% lower than that of 1920, which was the year of maximum average value—$19.51.

Fuller's earth is a term used to include a variety of natural substances that possess the property of absorbing grease or clarifying, bleaching or filtering oil. The original use of fuller's earth was in the fulling of cloth, but little of it is now used for this purpose. It is used almost exclusively in the bleaching or filtering of mineral and vegetable oils and animal fats.

The apparent consumption of fuller's earth in the United States in 1931 was about 284,000 short tons, a decrease of 14% compared with 1930.

The above information is contained in an advance summary of the Fuller's earth industry in 1931 by the Bureau of Mines.

Natural Sodium Compounds Industry in 1931

THE PRODUCTION of sodium compounds, not including common salt, from natural salines and brines in the United States in 1931, as indicated by sales or shipments by producers, amounted to 283,640 short tons, valued at $6,182,971. These figures include the output of sodium carbonate (soda ash and trona), sodium bicarbonate, sodium sulphate (salt cake and Glauber's salt), and sodium borate (borax and kernite), and show a decrease in both quantity and value as compared with the output of 297,440 short tons, valued at $6,897,504 in 1930.

The sodium carbonates reported in 1931 were from California and amounted to 78,530 short tons, valued at $1,223,544 compared with 90,300 tons, valued at $1,585,786 in 1930.

The sodium sulphate (salt cake and Glauber's salt) shipped amounted to 32,510 tons, valued at $198,132 in 1931, compared with 32,630 tons, valued at $206,323 in 1930.

The total boron minerals shipped in 1931 amounted to 172,600 tons, valued at $4,761,295, compared with 177,360 tons, valued at $5,351,999 in 1930.

According to figures of exports of the Bureau of Foreign and Domestic Commerce, the exports of borax in 1931 amounted to 86,938 short tons, valued at $3,358,609, compared with 82,931 short tons, valued at $3,057,794 in 1930.

This information is contained in an advance summary of the industry by the U. S. Bureau of Mines.

Standards Yearbook for 1932

A PICTURE of the standardization movement in various fields of industry, together with outlines of the standardization activities and accomplishments of all agencies of the Federal government, states, counties, municipalities, technical societies and trade associations are contained in the Standards Yearbook for 1932, recently issued by the U. S. Bureau of Standards.

Information on activities of the Bureau of Public Roads, Bureau of Mines, Bureau of Standards and the Geological Survey are given. Activities relating to building and housing and building construction, cement and concrete, clay and silicate products, lime and gypsum, and stone are also told.

Tests of Waterproofing

RESEARCH PAPER No. 394, "Tests of Integral and Surface Waterproofings for Concrete," has been reprinted from the *Bureau of Standards Journal of Research* for December, 1931, by the Bureau of Standards. The paper reports a study of 50 commercial integral and 50 surface waterproofing materials. A general résumé is given of the results obtained.

A Comparison of Costs of Quarrying Versus Mining of Stone

By George A. Morrison

THE ACCOMPANYING TABLE shows three sets of figures for the production of stone. The first column is taken as "good practice" from the returns of a questionnaire sent out by the Bureau of Mines and published in 1929. The second column is from figures presented at the 1932 meeting of the National Crushed Stone Association and is based on an annual production of about 650,000 tons. Both sets of figures are for the quarrying of the stone. The third column is of actual mining operations as of 1931 where a production of about 300,000 tons was attained from a 25-ft. deposit.

COMPARATIVE COST OF QUARRYING AND MINING STONE

	Quarrying 1	Quarrying 2	Mining 3
Timbering	.....	.....	$0.005
Stripping	$0.03	$0.017	.....
Drilling	.05	.041	.112
Blasting	.07	.035	.090
Loading	.07	.074	.078
Hauling	.07	.057	.066
Crushing	.06	.096	.035
Direct costs	.35	.320	.386
Reserve	.....	.038	.....
Overhead	.....	.057	.....
Depletion	.....	.010	.....
Special charges	.....	.030	.....
Storage	.....	.043	.....
Delivery	.....	.033	.....
General costs	.14	.211	.129
Total	$0.49	$0.531	$0.515

It is seen that the direct costs before the addition of the general costs are respectively $0.35, $0.32, and $0.385 per ton. To further simplify the comparison the six items of general costs may be assumed at $0.15 in all three cases. The table would then be as follows:

	Quarrying 1	Quarrying 2	Mining 3
Production cost	$0.35	$0.32	$0.385
Additional, gen'l costs	.15	.15	.15
Total for comparison	$0.50	$0.47	$0.535

Studying these figures brings out the following points:

1. Good quarry practice in drilling and blasting seems to vary from 7½ to 12c. per ton, while for the mining of the stone it runs around 20c. per ton. (The mining charge of drilling and blasting includes the cost of trimming roofs, etc., and the necessary protection to the workmen).

2. The loading and haulage charge seems about equal at 13 to 14c. (the haulage charge in either the case of the quarry or mine will increase somewhat as the length of haul increases. The figures given for the mine are for a 4000 foot haul to the crusher).

3. The crushing cost seems to vary considerably—from 4 to 10c. per ton. This may be due to the difference in the character of the stone, type of plant, trade requirements, and a number of other causes. The smaller dipper used in the mining (1¼-yd.) and the heavier dynamite load per ton of stone broken may considerably reduce the percentage of big pieces sent to the crusher so that in the case of the mining some of the work of crushing is being done by dynamite in breaking the material finer.

If we assume that crushing practice was standardized at 7c. per ton in all three cases, the total cost becomes:

	Quarrying 1	Quarrying 2	Mining 3
Total (for comparison)	$0.51	$0.445	$0.57

If we consider that by making these adjustments we have arrived at a fair comparison we find that the mining of 20 ft. of stone from a 25-ft. deposit costs 6c. more per ton than quarrying as in column 1 and 12½c. more than column 2, or 9¼c. more than the average quarrying cost shown in columns 1 and 2.

Assuming that the stripping cost is an average of columns 1 and 2, or about 2½c. per ton of stone, we have 11¾c. per ton of stone that we could spend for the stripping of a quarry before we would equalize the cost of the mining of the same deposit.

Assuming a shovel to strip and trucks to haul away the spoilage and that an average overburden being removed by such means would cost 30c. per cu. yd., we could strip 1 ft. depth of overburden per foot thickness of deposit before arriving at the cost of mining the same deposit with no stripping.

It can safely be assumed that where quarry costs are lower than the figures here shown, the cost of mining the same deposit would be correspondingly smaller than the costs shown for mining.

Apart from the difference in operating costs, mining methods can claim such advantages as possibilities of cleaner stone, no interruptions from weather conditions, usually smaller investment in broken tonnage, etc., but on the other hand present mining practice requires the leaving of from 40 to 60% of the deposit for the support of the workings.

Identification of Mineral Specimens

IN GENERAL almost every noticeably heavy mineral warrants attention, and more particularly so if it occurs in what appears to be a vein. Highly colored minerals may be worth examining, though iron pigments are common and may impart color to worthless rock.

In discussing the identification of minerals Bureau of Mines Information Circular 6597, in speaking of nonmetallic minerals, says it is often not so much the chemical constitution as the physical characteristics that have to be considered, and in those materials of which the chemical constitution is the determining factor as to its value, extreme purity is essential. For some requirements the presence of only 1% of certain impurities may render the mineral valueless. Local conditions and transportation facilities also influence the value of deposits.

Precious stones may be recognized by their extreme hardness or by their attractive color or unusual marking.

Most states have a state bureau where minerals found by residents of the state may obtain identification free of charge. The United States Bureau of Mines also gives advice as to prospective markets. The United States Geological Survey and the United States National Museum also inspect or make simple tests of specimens, under certain conditions. In addition, a list of public laboratories, by states, is included.

Mineral Resources of the Roanoke, Va., Area

MANY of the rocks of the Roanoke area contain minerals that are of economic value under favorable conditions of occurrence and favorable markets, but few of them are being mined now and the mining industry at present is of slight importance, states bulletin 34, "Geology of the Mineral Resources of the Roanoke Area, Va.," issued by the Virginia Geological Survey.

The most important materials being mined and quarried are: Clay, building stone, crushed rock, limestone, nelsonite, and slight amounts of iron. The production of none of these is very large. Coal, glass sand, barite and cement rock are of possible economic value, but they can only be developed under more favorable market conditions. The main natural resources of the area are, therefore, nonmetallic substances. A rather detailed report on the more suitable locations for cement production is given.

A report on minor nonmetallic resources is also given, in which asbestos, barite, bentonite, construction materials, glass sand, marl and ocher are briefly reviewed. The report also contains a list of selected references in which all published data on the area reviewed is listed.

Original Gasoline Tax Sponsors Are Against Diversion

Recent Statements by Legislators Who Introduced Bills Indicate Purpose to Build Highways with Motorists' Money

IN THE MINDS of legislators who drafted and sponsored passage of the original gasoline tax bills in the various state assemblies there was only one purpose: To provide improved highways for modern motor vehicle travel and to finance them by means of a tax assessed against the users, according to such use. Their conception was firmly founded on a principle of fairness. For that reason the gasoline tax remained the most popular and easily collectible levy, as long as the proceeds were used exclusively for highway improvement and faith was kept with those who pay the bill.

Oregon passed the first gasoline tax law in 1919. Recently, on the occasion of the 13th anniversary of Oregon's original 1-c. gasoline tax, Loyal M. Graham, of Forest Grove, who drafted the statute and C. C. Chapman, of Portland, one of its leading sponsors, declared taxation of motor fuel for other than highway improvement purposes never was contemplated.

"When I drafted the Oregon gasoline tax law," said Mr. Graham, "my idea and that of my fellow legislators was to create a fund for highway improvement. Such a tax is justified for that purpose, but it should not be diverted to other revenue needs."

Mr. Chapman said: "To obtain the support of vehicle owners for the new tax on gasoline, we assured them that the proceeds of the tax would be applied solely to highway purposes. Motor car owners, desiring highway construction and also sensing the need for adequate maintenance, supported the original gasoline tax and from time to time have supported additions to the gasoline tax rate. *Their support was based on confidence that none of the proceeds would be diverted from highway purposes.*

"It would be a violation of good faith to divert any part of the proceeds from highways, a violation which would provoke resistance and resentment.

"In relieving property of many millions of tax burden for highways, and assuming these burdens as a charge upon themselves, motor vehicle owners feel that motor vehicle and gasoline taxes should be protected from diversion into general governmental channels."

"Good Roads" Earle of Michigan Quoted

From Michigan comes evidence of the sincerity of purpose of those who introduced and furthered the original gasoline tax bill passed in the legislature of that state in 1925. Hon. Horatio S. Earle, first state highway commissioner of Michigan, recently wrote to Governor Brucker:

"The so-called gas tax is not a tax but simply toll, just as much as was the old toll paid to corporations that built and maintained the toll roads, paid by owners and users of automobiles to build and maintain roads, to be used for pleasure and business by them, and any of it that is taken and used for any other purpose is robbery."

The late Philip T. Cosgrove, president of the Michigan Good Roads Association and co-worker with Mr. Earle in securing acceptance for the gasoline tax principle in Michigan, explained his conception of the latter in the following statement:

"It so happens that gasoline consumed by automobiles is a practical measure to arrive at a fair and equitable amount the traveling public should pay for the use of Michigan roads.

Not a Tax But Toll for Use of Highways

"Therefore the gasoline tax should be looked upon and considered purely as a road toll to be used only for the building and maintenance of our great highway systems."

Senator Arthur Breed, president pro tem of the California senate, who is known widely in that state as the father of the gasoline tax law, has spoken and written exhaustively against the use of funds so secured for any purpose other than the construction of highways. In a recent address before the Coast Chamber of Commerce at Santa Rosa, Senator Breed said:

"I take this occasion to serve notice that there will be no hesitation to expose unjustifiable extravagances that have in a measure been continued even when the treasury was approaching exhaustion.

"The brilliant idea has been promoted to care in part for the treasury deficit by a raid on the gasoline tax funds. This proposed diversion of $4,250,000 per annum is essentially a new tax. It means that the motorists are to be taxed to pay somebody else's taxes.

"Diversion of these gas tax funds would mean that new road construction would be reduced by that amount. I contend that if we are to curtail highway development, then the gas tax should be reduced so that the taxpayer shall have the benefit of this economy."

Evidently Minnesota had the same idea about what gasoline tax proceeds were to be spent for as the states mentioned above, for Charles M. Babcock, widely known commissioner of highways of that state, says in a recent letter:

"The money the highway user pays in the form of a gasoline tax is really not a tax but a rental for the privilege of using the highway. Any money paid in and used for the purpose of efficient highway maintenance or construction is returned to the motorist in the form of decreased operating cost, far in excess of the tax.

"However, to take money derived from this source and use it for the routine expense of government is obviously unfair and should have the whole-hearted opposition of every motorist. There is no logical reason why this particular industry should be saddled with more than their due proportion of the general expenses of government, especially since they are to a very great extent taking care of their own highway needs."

Kentuckians may be celebrated as breeders of fast horses, but recent defeat of bills intended to divert several millions from gasoline tax funds shows a keen appreciation that motor vehicles and good roads have come to stay in the Blue Grass state. The following interesting statement by Hon. Lee Clark, member of the state house of representatives who drafted and presented the gasoline tax bill in the 1922 session of that body, indicates clearly the purpose actuating passage of the bill:

"The purpose and intention of myself, as the author, in introducing the bill, imposing and levying a gasoline tax upon the users of automobiles and motor vehicles, during the session of the General Assembly of Kentucky of 1922, also the purpose and intention of the said General Assembly, in enacting said bill into law, was to provide a fund to construct and maintain a highway system, causing the users of the highways to pay a toll in proportion to their use of the highways.

Court Decision Helps Kentucky

"The Court of Appeals of Kentucky has held that this fund shall not be used for any other purpose than aforesaid.

"I am opposed to any diversion of the gasoline tax for any purpose whatsoever, considering such as undemocratic and criminal."

Senator White L. Moss, who introduced the original gasoline tax bill in the Kentucky senate during the 1922 session of that body, said recently:

"As one of the originators in the 1922 General Assembly of Kentucky, my sole purpose in proposing a bill for the 1-c. gasoline tax was to cause the owners and users of automobiles to pay for the construction and maintenance of state highways in proportion to their use of these roads.

"I consider this tax merely toll tax on these roads. I can see no just or reasonable argument for diverting of any part of the gasoline tax for any purpose whatsoever."

Kansas Sponsors Against Diversion

In the sunflower state an agitation has started for the diversion of part of the 3-c. gasoline tax now collected to uses having no connection with the improvement of roads. A candidate for re-election to one of the important state offices recently came out as advocating that both gasoline tax and motor vehicle license fees be turned in to the general funds of the state to be reapportioned among the various departments.

In 1931 the Kansas state highway department had an income from the above sources of some $18,000,000, which was divided up approximately as follows:

(1) Administration of state highway department	$ 500,000
(2) Refunds to counties for county and township roads	3,600,000
(3) Apportionment for retirement of outstanding bonds on county roads now included in the state system	2,800,000
(4) Maintenance and gravel road replacement	5,000,000
(5) Maintenance of city streets on highway system	250,000
(6) New construction	5,850,000
Total	$18,000,000

These figures illustrate the great burden which Kansas road funds are now forced to carry. The state highway commission is constantly handicapped in this respect, which, of course, is no worry in the life of the diversionists. It is the motorist who pays and the motorist who then waits for his roads. C. H. Benson, auditor of the Public Service Commission of Kansas, a member of the legislature which passed the tax law, writes:

"I believe that the gasoline tax, when it is used for road construction exclusively, or rather the building and maintenance of roads in Kansas, is the most just tax that Kansas ever levied. However, if this tax on gasoline should be diverted to any other use except the building and maintenance of roads, I think it would be one of the most unjust taxes ever levied. I can hardly conceive that any man who knows anything at all about the taxing proposition would want to levy a tax on gasoline for any purpose other than I have stated above. I do not believe any legislature in Kansas would so far forget itself as to attempt to burden gasoline with taxes for any other purpose than for the building, construction and maintenance of the highways of Kansas. The people of Kansas, in my opinion, have too good judgment of fairness and honesty and decency in taxing matters to ever attempt to place any more additional burden upon the gasoline industry of Kansas or the United States for any purpose except the building, construction, and maintenance of the highways of this commonwealth."

That Kansas diversionists may be up against an insurmountable legal barrier to their plans seems likely from the following statement from State Senator Charles E. Mann, who was a member of the senate which passed the Kansas law:

"At the general election in 1928 the following amendment was submitted to the voters and carried by a large majority. It amended Section 9, Article 11, of the State Constitution as follows:

"'Section 9. The state shall have power to levy special taxes for road and highway purposes on motor vehicles and motor fuels.'"

"Under the amendment to the constitution you will notice that power to levy special taxes on motor fuels is given only 'for road and highway purposes,' and the tax could not, in my opinion, be diverted to any other use."

The foregoing and many other expressions by those who were responsible for the passage of gasoline tax legislation and commended these bills to the public as a logical and effective means of financing the building of a necessary system of good roads, indicate that these sponsors and the legislative bodies which enacted these bills into law did so purely and simply as road measures. In many cases they took what were considered effective means to prevent diversion. In almost every state assurance was given in advance of passage that the motorists' money so collected would be used only to provide highways.

Progress of Gasoline Tax Diversion in Various States Briefly Stated

CALIFORNIA—Effort to divert $4,250,000 annually to care in part for treasury deficits is being resisted by state automobile association and many public spirited individuals and groups.

FLORIDA—About 60% of gasoline tax receipts now diverted from highways. In addition to 7-cent state tax, cities are passing local gas taxes for various purposes.

GEORGIA—Although recent efforts to divert the gasoline tax from road uses were unsuccessful, the state highway department was forced to purchase bonds of the state-owned railroad between Atlanta and Chattanooga.

ILLINOIS—Some $12,000,000 has been withdrawn bodily from funds of state highway department, being replaced by tax anticipation warrants which are unsalable. This has necessitated a reduction of 25% in new highway construction, equal to about 250 miles of concrete road. Voters will shortly pass on bond issue of $20,000,000 to retire tax warrants issued for charity, bond issue and interest totaling $30,300,000 to be paid from gas tax proceeds.

INDIANA—Some $2,000,000 of the state highway funds, the income from gasoline and motor vehicle taxes was recently turned over to the general funds of the state on a "loan" basis but with no practical method of securing its return.

KANSAS—An agitation has been started for diversion and a candidate for re-election of one of the principal state offices advocates returning gasoline tax income to general funds of the state for reapportionment to state departments.

KENTUCKY—A number of bills recently introduced in the legislature for the purpose of raiding gasoline tax funds were all defeated.

LOUISIANA—State is spending about $1,723,000 out of gasoline tax revenues for port of New Orleans, port of Lake Charles and state board of education.

MASSACHUSETTS—Several diversion attempts were defeated recently in the legislature. Diversionists are said to be planning further attempts.

MICHIGAN—Legislature recently passed act to divert motor vehicle weight tax from state highway department to counties for various use.

MISSISSIPPI—Several bills introduced which would rob road funds of millions; a number of these contemplate increases in gasoline tax rate as well.

NEW JERSEY—Attempts to divert $16,500,000 from the state highway funds and to increase gasoline tax 2 cents per gallon recently defeated. Politicians are planning new attempts to obtain gasoline tax funds.

NEW YORK—Legislature recently diverted $51,000,000 from public works budget, reducing mileage of new roads from about 1000 to 355, about 7 miles per county. At the same time the gasoline tax was increased 2 cents per gallon.

NORTH CAROLINA—About 45,000 miles of local and county highways have been added to 9000 miles already under the jurisdiction of the state highway department with $6,000,000 additional funds. The maintenance of thousands of miles of country road must be done with funds intended to finance the construction of permanent trunk highways.

OHIO—Act recently passed permits share of gasoline tax and license fees allotted to local units of governments to be used for poor relief. This legalizes the possible diversion of some $30,000,000.

TENNESSEE—The Tennessee gasoline tax of 7 cents a gallon has been split up as follows: For state highways, 1.9c; Smoky Mountain Park, 0.1c; county bonds assumed by state, 1.0c; maintenance and construction of secondary and rural roads, 2.0c; retirement of state highway debt, 2.0c. The state recently diverted $5,000,000 of the highway department's money, even taking $1,200,000 then on deposit in banks.

TEXAS—It is proposed to increase gasoline tax from 4c to 6c per gal. and to decrease the share allotted to state highways from 3c to 1½c. Under this arrangement 3c

per gallon would go into the general fund of the state and 1½c into the school fund.

UTAH—The state recently "borrowed" $700,000 from state highway funds. There is no known method of forcing the return of these funds.

VIRGINIA—County and township roads have been turned over to the state highway department to maintain and operate with the budget normally available for the building of permanent state highways. The maintenance of the country roads is a perpetual task which will bleed these funds and do nothing toward reducing future maintenance.

WISCONSIN—Gasoline tax proceeds being used to compensate communities to the extent of their loss through the abandonment of personal property taxes on motor vehicles.

Recent Press Comment on Diversion of Gasoline Tax Funds

We do not think there is any single phase of unemployment relief which has wider effect and which brings more valuable returns for dollars spent than the building of good roads. Not only does a lively highway construction program give steady work to thousands of men, but its ramifications in the direction of stimulating industry in general are manifold. And after the money is spent, the people who spent it, the taxpayers, find themselves directly benefitted in all the many ways in which the creation of easy communication facilities effect. Money spent for roads produce concrete results!

It is not just to tax motorists more heavily than ever and with the same legislative gesture to reduce by two-thirds the expenditures which will benefit motorists directly. In the second place, and this is still more important, it is not wise at a time like this to smash to pieces the most satisfactory machinery which the state has to care for its unemployed. How *does* the state plan to do its duty toward the unemployed?—*Glens Falls* (N. Y.) *Post Star.*

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Tax chasers everywhere thirst for the motorist's gasoline. This gas tax revenue that flows so freely for road building makes their mouths water to dip in for other purposes. They must be resisted.—*San Francisco* (Calif.) *Chronicle.*

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Special taxation of motor vehicles was started to supply money for better roads, and the motorists consented because they felt they got their money back in lowered cost of operation and longer life of their cars. But much of the automobile tax money now is used for purposes other than roads. Some estimates figure this as one-fourth. Constantly less is used for roads and more for other purposes.

In Wisconsin, notwithstanding that the rate of gasoline has been doubled, taking annually $8,000,000 more from the motor vehicle owners, not one additional mile of paving will be built than was customary under a tax of 2 cents per gallon. In fact the 1932 paving program is one of the smallest in recent years. It may be increased if President Hoover approves the special federal highway aid appropriation passed by Congress.—*Milwaukee* (Wis.) *Journal.*

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"The resolution of the Utah State Automobile Association protesting against the 'loaning' of gasoline taxes from the state road fund to the state general fund has brought to the attention of the motoring public that taxes paid by them for the express purposes of building roads have been diverted for other purposes," said W. D. Rishel, manager of the Utah Automobile Association, in a statement issued Thursday.

"Further," Mr. Rishel said, "there is no question but that it is illegal to spend gasoline taxes for any other purpose than roads, and if this tax is producing more funds than are needed, the tax should be reduced. Any other purpose than roads is an outrage against the motorists, and the Automobile association will continue to protest just as strongly as we can and depend upon an enlightened public opinion to back us up."—*Salt Lake City* (Utah) *Tribune.*

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Renick W. Dunlap, assistant secretary of agriculture, stated at the recent convention of the U. S. Good Roads Association held here: Legislatures throughout the country are beginning to look to the gasoline tax for funds to fill in the gap in government income resulting from general shrinkage of tax receipts. The inevitable result will be riding a good horse to death.—*Jacksonville* (Fla.) *Times-Union.*

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"Luxury?" The motor car graduated from that class long ago. It is now a necessity if there ever was one.—*San Francisco* (Calif.) *Chronicle.*

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When the Legislature adjourned it left the highway appropriations in shreds, with only 355 miles to be built under the 1932 program, as compared with 1009 miles in 1931.

At the same time the gasoline tax was increased 1 cent, a rise of $15,000,000, which the motorist will pay, but none of which will go to highways.

The result of this legislation is that in 1932 motorists will pay $92,000,000 in motor vehicle and gas taxes, and will get only 355 miles of highway, as compared with the $71,000,000 paid in these taxes in 1931, when 1009 miles of highway were built. And thousands of men will lose their jobs.

In place of building highways, the legislature voted $5,000,000 for relief and shifted on to the people for a referendum vote a proposal to raise $30,000,000 by bond issue for general relief—an expenditure for which the taxpayer will get no adequate return in public improvements.—*Motordom,* Official Organ of New York State Automobile Club.

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"The gas tax was created and sponsored by those using the highways to appease the demand and need for road building and is a user tax. Whenever it is diverted to other purposes than for which it is intended, it becomes a luxury or special tax, and to divert it is not only improper and unethical, but unjust," says C. A. Schutze in *Texas Highways,* to which the people as a whole agree.—*Amarillo* (Tex.) *News Globe.*

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Motorists of the nation who right now are paying in combined gasoline, personal property and registration taxes something more than a billion dollars a year listen with little patience to the arguments of men in state and national legislatures to add to the burden or to make use of gasoline taxes for purposes other than road building and maintenance.—*Oakland* (Calif.) *Tribune.*

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The eventual result, if the tendency be not curbed, will be to reduce the use of motor vehicles and place the horse again in harness as a common sight on our streets and highways. The automobile at first was a luxury but rapidly won a place as an essential of industry. To restrict its use to that of its original position would be a blow to industry. Yet this stands as the logical sequence in the ever-mounting taxes being placed on it.—*Charlestown* (W. Va.) *Mail.*

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Highway construction this year as a permanent advantage to communities, as well as a means of meeting the demands of the unemployed, not only in actual road work but in cement mills and trucking, etc., was unanimously indorsed by the Common Council last night when that body went on record for a road building program this summer as large for the state as that of last year. Contemplated reduction in the road building program means that 30,000 more men will be out of jobs this year, it was stated.—*Hudson* (N. Y.) *Register.*

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A blow at the automobile is a thrust into the very vitals of American economic life. . . . The automobile is no longer a pleasure vehicle and is in no sense a luxury.—*Sacramento* (Calif.) *Union.*

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The people of the various states may expect attempts to raid gas tax and automobile license funds for diverse governmental purposes during the coming year. It is an attractive morsel for politicians who are seeking methods of raising funds.

The highways and the motor cars are separate units of one transportation machine. The automobile in the last fifteen or twenty years has advanced to the status of a necessity. The automobile can only function satisfactorily because good roads have been provided upon which they can travel. Good roads not only reduce the cost of automobile operation, but they reduce the time required in traveling. A saving in time is a saving in money, just as surely as savings in oil, in gas and in car repairs, effected by the substitution of good roads for poor ones, puts money in the pockets of the car owner.

The work of creating good public highways is a long way from completion. In fact, our road systems will never be fully completed. Thousands of miles of highways in the Northwest are today deplorably in need of improvement.

The toll in the form of gas tax and license fees, which the car owner pays for the privilege of operating his car on the public highways, should be reserved for expenditures in the construction and maintenance of highways. To divert such funds to other purposes is unfair to car owners and the public.—*The Improvement Bulletin,* Minneapolis, Minn.

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Advocates for diversion should remember that a portion of the highway revenue is obtained from out-of-state tourists and business interests using our roads. It is true that a well-governed state makes for better touring conditions, but the chief of all advantages to visiting motorists is an adequate highway system.—*Grand Haven* (Mich.) *Daily Tribune.*

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The gasoline tax was not designed to propagate oysters, for schools, for payment of teachers or docks or sea walls nor was it intended as a dole.

It is plain that diversion of gasoline tax receipts can not be justified now by the contention that the highways are adequate. States that have good highway systems need better ones. In Indiana, for example, much expensive highway widening is needed. Thus Indiana gasoline tax receipts can not be justly expended for anything but highway construction. When the highway requirements are less pressing it will be time to

suggest that gasoline be taxed for school maintenance and other projects and let the automobile drivers decide whether or not that is desirable.—*South Bend* (Ind.) *Tribune.*

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Tennessee last year decided to levy an additional $2 tax on every automobile, the income to be diverted to the general fund.

There was strong protest from autoists against using this form of revenue for other than roadbuilding purposes, especially when the legislature at the same time increased the gasoline tax from 5 cents to 7 cents a gallon. But the resentment was particularly against the change of policy regarding the use of the money.

That resentment has now expressed itself in an autoists' strike. During the opening months of 1931, before the new levy was in operation, a total of 175,000 automobiles were registered, producing in fees a sum of $2,490,000. This year for the corresponding period only 133,000 cars have been registered, and the state's income has been only $1,875,000.

So instead of obtaining $350,000 more revenue, the state treasury is the loser by almost $500,000. Automobile association officials insist that not more than one-fourth of the 40,000 cars which were not registered this year are idle on account of business conditions and that 30,000 autoists have gone on a tax strike.

The incident demonstrates a popular attitude which is not far beneath the surface in the minds of hosts of people.

When tax burdens get too heavy they simply are not shouldered, either from inability or from unwillingness. When that point is reached it is already too late to prevent some of the damage to the taxation machinery. It is far better to give more heed to the taxpayer while he is yet protesting than drive him into bankruptcy or revolt.—*Burlington* (Vt.) *Free Press.*

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Some interesting attempts to divert gasoline tax proceeds were defeated recently in the Massachusetts legislature. There was house bill No. 248 proposing additional gasoline tax to provide funds to settle accidents. House bill No. 362 proposed another gas tax for insurance purposes. No. 864 would have added two cents per gallon to the tax and an increase in registration fees for insurance purposes. Fortunately organized motorists tought these bills as contrary to the purposes for which the tax on gasoline was established and all of them were rightfully defeated.—*Massachusetts State Motorists' Association.*

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When construction stops either for seasonal halting or because road money collected in gasoline taxes is diverted into unrelated channels, the effect in added unemployment is apparent. Then it is that the importance of the road industry as an employment factor is recognized.—*Kansas City* (Mo.) *Star.*

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The user tax on gasoline which is threatened with diversion to other purposes than roads becomes a luxury tax, like the wartime tax on theatre tickets, when diverted to purposes other than roads. The motor vehicle is no longer a luxury and this diversion of funds on the basis that the automobile is not needed except as a luxury will work hardship of 26,000,000 motor vehicle owners. This tax was sponsored for road building by motor vehicle owners who understand that without roads motor vehicles cannot operate to best advantage.—*Texas Contractor.*

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There is a movement afoot in many states to divert the proceeds of the road tax to a variety of purposes. No matter how commendable the latter, such a proceeding would break faith with the motorists, continue to impose the tax upon them without providing the roads, and would throw out of employment hundreds of thousands of working men who are dependent upon road building.—*Allentown* (Pa.) *Chronicle and News.*

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In convention at Miami, Fla., the United States Good Roads Association adopts resolutions vigorously protesting against diversion of the gasoline tax to other purposes than road-building. The gesture is sound and appropriate and timely, but like the others gone before will be blandly ignored by taxeaters and tax-makers pretty much the country over. The gas-tax diversion craze has spread steadily and far during the past few years, despite frequent resolutions of protest. So little have the anti-diversion resolutions impressed tax authorities that we find a state official in one commonwealth, within the past few days, urging the whacking up of that state's gas tax and its diversion into the general fund, because it is not "burdensome" and is so cheerfully and willingly paid.

If ever this unfair and unsound diversion of a special tax dedicated to a special purpose is checked, the checking will have to be done by something more effectual than convention "resolutions." It will require, we have an idea, concert of individual action by the motorists who now are classified in official circles as "easy marks."—*New Orleans* (La.) *Times-Picayune.*

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Road-tax diversion by the last New York state legislature is indicative of a desperate attempt by legislatures of all kinds from the Federal congress down to township supervisors to evade real taxation issues. Public agencies with depleted treasuries are bombarding the legislatures for money, and the lawmakers are taking it where they find it. The motor-vehicle tax for roadbuilding is the present most obvious source of ready money and is therefore being robbed. Its protection calls for defense as desperate as are the attacks being launched against it.—*Engineering News-Record.*

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The public must make itself felt, in no uncertain way, if it is to keep the marauding hands of the gas-taxers out of its pocketbook.—*Oroville* (Calif.) *Press.*

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Merely because it has in the past proved easy to impose a gasoline tax, those not affected are beginning to look upon gasoline as the carry-all for public burdens. This unfair discrimination against one commodity and one class of consumers should stop.—*Illinois Petroleum Marketers.*

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The state road funds need 100% of the gasoline tax receipts. I am not in favor of diverting them for any purpose whatever, whether it be to the counties and municipalities, or for other state purposes, such as to help out the general fund of the state.—Secretary of State Milton H. Welling of Utah.

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A reasonable gas tax—with stress on the word "reasonable"—all of whose receipts are used for road work, is sound and it is accepted as essential by the majority of motorists. But when the gas tax goes beyond certain levels, or when the revenue derived is applied in other directions, it becomes class taxation of the most onerous kind.—*Fairfax* (Va.) *Gazette.*

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Taxing the automobile owner has been a favorite indoor sport ever since machines began to assume taxing proportions. Motorists have not begrudged taxes that have come back to them in the form of good roads. But we think that they will not sit silent under a proposal to make them the goat in the matter of Federal revenues.—*San Francisco* (Calif.) *Argonaut.*

Can't Build Too Many Good Roads

"AS AN OUTLET for surplus labor, highways offer the best opportunity, for they are about the only thing that can be produced without glutting a market," Frederic E. Everett, president of the American Association of State Highway Officials, has declared.

"More men cannot be placed at work in mines or factories because there is already too much of almost everthing," said Mr. Everett. "But in building highways no market is further saturated; nothing is created that must be purchased before it can be placed in use.

"The dollar spent for roads serves a double purpose. It builds something for which there is a huge public need and appetite. It gives labor something to spend which in turn relieves the myriad industries suffering for want of outlets for their goods.

"Properly built highways become of immediate service and start at once to reduce car operating and road upkeep costs. Where traffic is at all noteworthy it is cheaper to have good highways than to permit poor ones to exist. This country right now could build a hundred thousand miles of fine pavement and make good use of every mile."

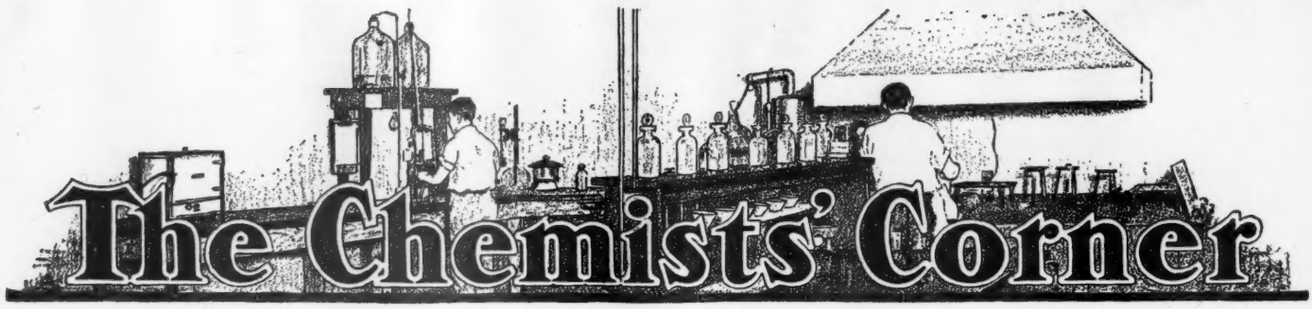
Kentucky Newspapers Urge Extensive Road Programs

NINE TIMES as much road building should be done his year than in previous years if estimates on material and labor are correct, the *Shelby News,* Shelbyville, Ky., states and is quoted at length by the *Louisville Courier-Journal.* The story is based on the fact that Kentucky will receive three times more federal aid than previously for its road work and that "the cost of building material, particularly for high class concrete roads, is hardly one-third as much as it was three and four years ago, and contracts have recently been awarded for concrete construction at a cost per mile less than one-third that paid for the same class of roads when their construction was first undertaken by the state."

Peace Pipe Quarry Still Worked

QUARRIES, long sacred to Indians, who obtained from them stone for peace pipes, are to be preserved as a state park under a movement begun at Pipestone, Minn.

Each summer many members of tribes come to get stone for their sacred ceremonies.—*Warren* (Ohio) *Tribune.*



Determination of Fatty Anhydrides in Cements

By J. L. Heitzman and George Coventry
Vice-President and Chief Chemist, respectively, E. L. Conwell and Co., Philadelphia, Penn.

THE INCREASING USE of integral waterproofing compounds in both portland and masonry cements makes it imperative that some rapid inexpensive method be evolved for the determination of these compounds.

The compounds added for waterproofing purposes are chiefly the stearates of calcium or ammonium. Stearic acid is also used to a considerable extent. The stearates on the market for this purpose are rarely pure as they contain considerable oleate and palmitate. Also the compound in powder form usually consists of a large quantity of hydrated lime, siliceous matter or other harmless filler.

The method outlined below is not for the purpose of determining the individual fatty anhydrides present, but rather collectively. For the individual determinations, the value does not at present warrant the time and expense involved. It is recommended therefore that in the absence of any definite information, the total fatty anhydrides be calculated to calcium stearate.

Method

Weigh 20 grams of the sample, transfer to a 400-c.c. beaker, add 200 c.c. of 1-3 hydrochloric acid and digest until solution has been accomplished. Transfer to a 500-c.c. separatory funnel, add 75 c.c. of sulphuric ether and shake thoroughly. Let stand until separation is complete, about 15 minutes or when the lower layer is transparent. Draw off the dissolved cement, wash the ethereal layer several times with cold water until the acid is expelled. Draw off the ethereal layer containing the dissolved fats and oils into a weighed platinum dish. Evaporate to dryness at 50 deg. C. in an oven. Cool and weigh. Treat the residue with 15 c.c. of chloroform, allow to stand until the fats are in solution. Pour the extract into a weighed platinum dish and evaporate as before. The difference between the first and second weights multiplied by five equals the percentages of fatty anhydrides present.

The ether extract may contain some mineral oil present through the process of manufacture and possibly a small amount of mineral matter from the cement.

If it is not desired to correct for any mineral oil, ignite the residue after the first weighing and subtract the weight of the ash from the total.

Considering the whole of the fatty anhydrides as stearates, the weight or percentage multiplied by 1.07 equals the calcium stearate present.

It should be remembered, however, that although 2% of a commercial powdered calcium stearate may be added to a cement as a waterproofing agent, it does not follow that the analysis of the cement will show 2% calcium stearate since the commercial product may actually contain but 20% fatty anhydrides, the remainder being hydrated lime or siliceous matter.

Determination of Fluorine in Phosphate Rock and Slags

D. S. REYNOLDS and K. D. Jacob of the Bureau of Chemistry and Soils, Washington, D. C., give the results of their study of determining fluorine in phosphatic materials, in a recent issue of *Industrial and Engineering Chemistry*. The ordinary volatilization method is known to give too low results and the lead chlorofluoride method as developed by Hoffman and Lundell recovered only about one-half of the fluorine. The fusion with Na_2CO_3 does not put all the fluorine in a water soluble form with or without the addition of silica, this being due to equilibrium actions involving insoluble fluophosphates like fluorapatite.

The removal of calcium and phosphate from the melt after fusion was found to be essential, and after this was done the method of Hoffman and Lundell could be used.

The procedure is to fuse 1 g. of the 100-mesh sample 1 hr. at 900-950 deg. C. with 2 g. Na_2CO_3, if rock, and 5 g. if slag. The cooled melt is digested overnight with 50-75 ml. water, the clear solution is decanted through a filter, and the lumps digested in a 1-2% Na_2CO_3 solution. The filtrates contain the greater part of the fluorine.

The residue is treated with 3 ml. HNO_3 and 50 ml. water for about an hour. Calcium is then precipitated by adding 50 ml. of a 5% oxalic acid solution, and then Na_2CO_3 until neutral to methyl orange. Boil and filter and wash precipitate 4 to 5 times with cold water. Filtrate is made acid to methyl orange and 4 ml. of concentrated nitric acid and 10 ml. saturated potassium permanganate solution are added, followed by enough more to cause a permanent brown coloration or a dark brown precipitate. The solution is filtered and washed 4 to 5 times with a hot Na_2CO_3 solution and the filtrate diluted to about 250 ml.

The remaining procedure is essentially that of Hoffman and Lundell, in which hydrochloric acid, lead nitrate and sodium chloride are added to precipitate lead chlorofluoride. The chlorine is determined by adding silver nitrate and titrating the excess with potassium thiocyanate. But the directions for doing this show many details that require careful manipulation.

The authors say the new method gives about equal results on all phosphate rocks and pebbles except the Tennessee blue rock, on which the results are lower than the volatilization method. Florida waste pond phosphates, and slags, are higher in fluorine by this method. It is therefore recommended for these materials, but the volatilization method is recommended for the ordinary commercial analyses of the others.

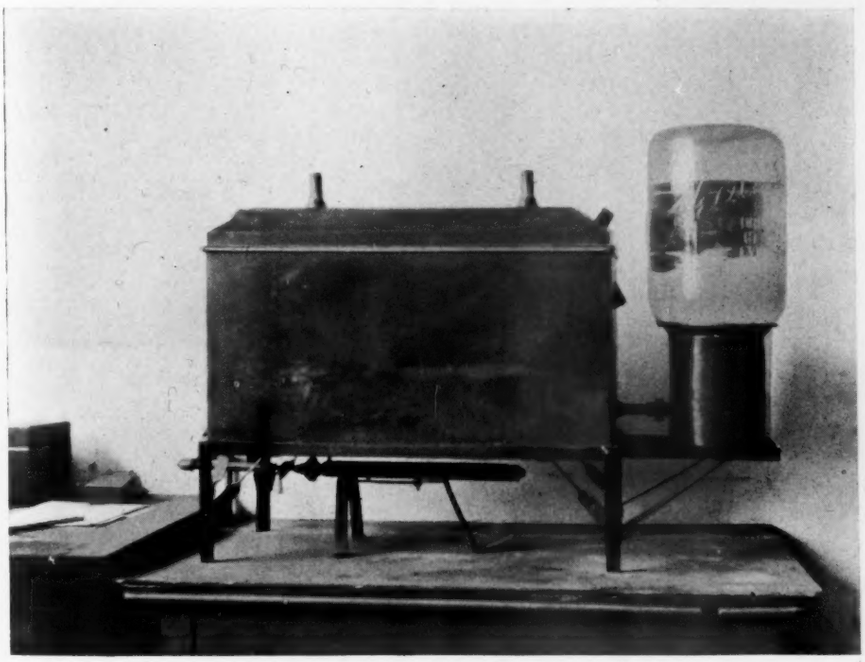
Keeping Constant Boiler Water Level in Test of Cement

By C. H. Lovejoy
Chief Chemist, The Forest City Testing Laboratory Co., Cleveland, Ohio

A UNIQUE METHOD for keeping a constant water level in the boiler used for the soundness test on cement is shown in the accompanying picture.

In the soundness test a pat of neat cement 3 in. in diameter and ½ in. thick that has hardened for 24 hours on a glass plate 4 in. square is exposed to the action of steam for 5 hours just 1 in. above the surface of boiling water. The A. S. T. M. prescribes the size of copper vessel used for the test, but not the details of the constant level bottle.

The device illustrated consists of a small round reservoir attached to the rectangular boiler, and it is formed to fit a 5-gal. water bottle in the same manner that these bottles are used in office drinking fountains. The mouth of the bottle is 1 in. lower than the shelf in the boiler on which the test pats rest, and as the water boils away additional water flows from the bottle to replace it. The water in the glass bottle becomes warm, but not hot. The outfit occupies a minimum of space and is entirely one unit.



Boiler with reservoir and water bottle at right

Determining Small Amounts of Iron in Glass Sand

ORDINARY PUBLISHED METHODS of determining the small amounts of iron in glass sand are tedious if they are accurate. Lewis B. Skinner in a recent issue of *Industrial and Engineering Chemistry* describes a method with a thiosulphate titration, which he says is accurate and rapid. For sands containing up to 0.25% aluminum oxide, 10 g. of a 100-mesh sample are weighed into a 250-ml. silver dish and 75 ml. of 48% c. p. hydrofluoric acid is added. This is evaporated to dryness. After cooling, 10 ml. of sodium hydroxide and 1 ml. of sodium chlorate solution are added and evaporated to dryness. The dish is then heated to incipient redness for quiet fusion. Heating must not be stopped when effervescence due to dehydration ceases. After cooling, 100 ml. of hot water is added and the mass is warmed to melt it and then transferred to a 250-ml. beaker. The dish is scrubbed and stains removed with a few drops of hydrochloric acid. Then 100 ml. of hydrochloric and 1 ml. of nitric acid are carefully added and boiled a while to dissolve the iron hydroxide. After cooling somewhat, ammonia is added in excess, the whole is boiled, allowed to settle a few minutes, and then filtered through a 9-cm. filter paper and washed five times with hot water. The filtrate is discarded. The precipitate is washed back into the same beaker, which is placed under the funnel and a mixture of 5 to 10 ml. of water and exactly 1 ml. of hydrochloric acid is poured through the filter. This will dissolve iron hydroxide but may leave other constituents. One should not be deceived by the yellow residue of titanium peroxide which is sometimes formed. Set a 180-ml. copper flask under the funnel to catch the last drops and do not wash paper. Boil the contents of the flask to about 10 ml., cool, and titrate with standardized thiosulphate solution in an atmosphere of carbon dioxide.

A blank should be run in every case, as a certain amount of thiosulphate will be required by the hydrochloric acid present.

Where the alumina is relatively high the sodium chlorate is omitted in the fusion. After the 100 c.c. of hot water is added, a few ml. of hydrochloric acid are added to partly neutralize alkalinity. The still alkaline solution is then boiled and allowed to stand until the supernatant liquor becomes yellowish; preferably it should stand overnight. It is then filtered through a 9-cm. paper and washed several times with warm sodium sulphide water. The filtrate should be yellow, and it is discarded. The bulk of the precipitate should be washed into the same beaker, which is then placed under the funnel. The paper is washed with a boiling mixture of strong hydrochloric acid and 7 ml. water. Any coloration from silver sulphide may be ignored. An excess of ammonia is added to the filtrate, which is boiled and poured through the paper into a copper flask. The remaining procedure is as before.

The starch solution is that recommended by Low. The standard solution of thiosulphate contains 1.55 grams of the c. p. salt in 1 liter distilled water. It is standardized on 15-16 mg. cleaned iron wire, weighed on the gold button balance, or a piece 10 in. long weighed on the analytical balance and cut into five sections exactly 2 in. long. The original article gives very detailed directions for the standardizing and the titration.

Breaking of Bituminous Emulsions by Contact with Stone

A NEW METHOD of determining the behavior of bituminous emulsions in contact with stone has been developed by Hans Weber and Hermann Bechler in a procedure determining the amount of material taken as a coating upon the stone. Dependent factors have been investigated and limits of accuracy and duplicability determined for a number of different stones and emulsions. Behavior of emulsions toward a given stone cannot be predicted from results obtained with another; laboratory tests with individual materials are required. Series of tests do show variations in stability of emulsions as used, variations due to origin and weathering of materials, etc. Tests enable allowances to be made with properly active emulsions for unfavorable building conditions or materials as well as plant control of emulsion manufactured. The use of soap or alkali in emulsions is not necessary except with passive stone. Results are compared with those of other methods.—*Chemical Abstracts.*

Hints and Helps for Superintendents

Designing the Belt Conveyor—Types of Drive

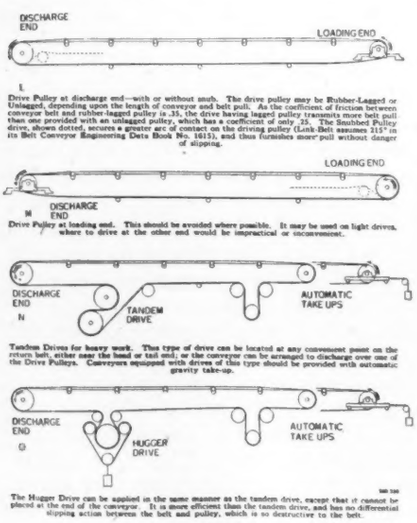
THE PROPER DESIGN and wise selection of the parts that make up the belt conveyor determine the efficiency or the success of the installation. The most important elements are: The belt to carry the material; the idlers to support the belt; the drive through which power is transmitted to the belt; the loading conditions or method of delivering material to the belt; and the tripper, or other means of discharging material from the belt.

The belt, the idlers, the drive and the tripper each is made up in various types, and each type has a proper use.

Since the belt is the only part which comes into direct contact with the load, it is the only part which is subjected to the wear and tear of handling the material. It is, therefore, the most expensive part of the conveyor from a maintenance standpoint. Every means should be taken to select a belt which is the most economical in the long run, and to protect it from unnecessary injury and wear, thus adding to its life of service.

The loading conditions are important, as everything should be arranged to have the material reach the belt in the same direction and speed of motion as the belt has; and with as little drop and impact as practicable, especially where the material is abrasive, or sharp-pointed and heavy.

Belts should be specified according to the conditions under which they are to operate,


DISCHARGE END
LOADING END
L
Drive Pulley at discharge end—with or without snub. The drive pulley may be Rubber-Lagged or Unlagged, depending upon the length of conveyor and belt pull. As the coefficient of friction between conveyor belt and rubber-lagged pulley is .35, the drive having lagged pulley transmits more belt pull than one provided with an unlagged pulley, which has a coefficient of only .25. The Snubbed Pulley drive, shown dotted, secures a greater arc of contact on the driving pulley (Link-Belt assumes 215° in its Belt Conveyor Engineering Data Book No. 1015), and thus furnishes more pull without danger of slipping.
LOADING END
DISCHARGE END
M
Drive Pulley at loading end. This should be avoided where possible. It may be used on light drives, where to drive at the other end would be impractical or inconvenient.
DISCHARGE END
TANDEM DRIVE
AUTOMATIC TAKE UPS
N
Tandem Drives for heavy work. This type of drive can be located at any convenient point on the return belt, either near the head or tail end, or the conveyor can be arranged to discharge over one of the Drive Pulleys. Conveyors equipped with drives of this type should be provided with automatic gravity take-up.
DISCHARGE END
HUGGER DRIVE
AUTOMATIC TAKE UPS
O
The Hugger Drive can be applied in the same manner as the tandem drive, except that it cannot be placed at the end of the conveyor. It is more efficient than the tandem drive, and has no differential slipping action between the belt and pulley, which is so destructive to the belt.

Courtesy of Link-Belt Company, Chicago, Illinois

Various types of belt conveyor drives

and weight of fabric, number of plies, and thickness and grade of rubber covers must be properly combined to secure the most economical service.

Anti-friction idlers are recommended in all cases when long life of equipment and low maintenance costs are given due consideration.

The use of the proper type of drive may mean the saving in cost of an extra thickness of conveyor belt, or an important reduction in belt stress. The proper relation between belt stress and thickness and grade of rubber cover should be given careful consideration in the selection of the type of drive and the grade of belt.

Both the drive and the idlers determine the efficiency of the belt conveyor and the number of plies or thickness of conveyor belt necessary to transmit the belt tension or pull required in driving it.

In the accompanying diagrams the expression "drive pulley" indicates the pulley which gives motion to the conveyor belt, whether it be the head or tail pulley or located at some intermediate point.

Tractor with bulldozer keeps quarry floor clean for trucking

Mine or Quarry Floor Cleaner

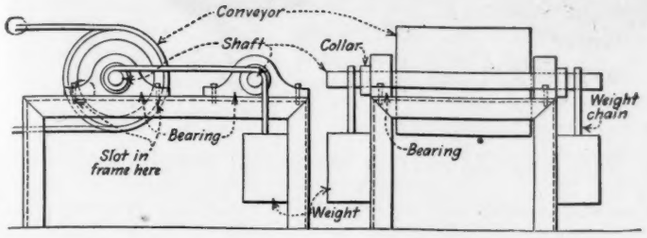
WHERE TRUCKS are used in a quarry or mine for the transportation of the stone to the primary crusher a clean roadbed is necessary if full life is expected from the truck tires so the device in use at the Pixley mine of the Stewart Sand and Material Co., Kansas City, Mo., should be of interest to all quarry operators that use truck transportation.

After each shot in this mine a Caterpillar "30," to which has been affixed a "pusher" type scraper, commonly called a "bulldozer," is run into the mine, and all the loose rock that has been thrown about the mine from the blasting is pushed toward the face where the electric shovels can load the stone to the trucks.

Automatic Conveyor Tightener Prevents Slippage

AN UNDESIRABLE occurrence in the operation of a chain conveyor is the slippage of links caused by chain slackness, as it incurs rapid wear of the chain, sprocket wheels and drive mechanism and R. M. Thomas, Denver, Colo., has described a way to prevent it in the *Engineering and Mining Journal*.

Such occurrences are especially frequent with conveyors exposed to the heat from a furnace or a kiln; repeated adjustments are necessary to counteract expansion and contraction, causing expense and loss of operating time. This can be effectively overcome



Self-adjusting tightener for chain conveyors

by the use of the self-adjusting, simple tightener shown in the accompanying illustration, it states. It consists of two counterweights, two short chains and a stationary shaft, supported and held in place by two bearings and two collars fitted with setscrews, on the drive end of the conveyor. The four slots on the end base of the conveyor, with the loosely adjusted bearing bolts, secured by counter nuts, render the entire conveyor end movable, thus permitting the counterweights to balance and to hold the conveyor chain under constant tension. On heavy conveyors the weights should be suspended from longer chains into depressions cut in the floor.

Homemade Switches and Frogs

FOR a temporary switch or one that is infrequently used it is not always necessary to install standard track equipment. At the Puslich, Ont., plant of the Canada Crushed Stone Corp., Ltd., only a relatively small tonnage of stone is handled and this tonnage is intermittent so that it behooves the operators to keep their investment down to a minimum figure. One way of doing this was to install inexpensive frog and switch points in the quarry, as shown in the illustrations.

The frog is simply a steel plate roughly 12-in. by 16-in., placed between the ends of the cross-over rails. The cars pass over this plate safely and easily as the outboard flange wheel keeps the car in alignment due to the rail guard at that point.

The switch points are short pieces of rail which have been made wedge-shaped and hinged to the cross-over rail so that the car, on its way to the crusher, throws the switch points into alignment. The whole, while apparently crude, is quite effective.

Unusual Pump Renovation

NEW IDEAS for repairing gray iron castings are often suggested to the mind of the welding engineer through former methods of repair. One case of this type occurred recently in the rebuilding of a worn-out vacuum pump casting by a marine engineering company.

The welding engineer of the marine repair works was consulted as to the advisability of a repair by ox-welding. He believed that if the pump was removed to his plant it could be rapidly and efficiently rebuilt by the oxy-acetylene process at a cost that would be considerably less than the cost of a new casting, an article in *Oxy-Acetylene Tips* reports. It was decided to do this.

A survey of the water end of the pump disclosed that eight discharge ring sleeves machined from cast iron had been fitted to the upper valve deck and pressed in. Some of these rings had become loose and had interfered with the proper functioning of the pump. Accessory parts of the pump had become worn down until they also needed repairs. These were: the pump bucket, which needed a new bronze face on the rings; bronze valve guard spindles that hold the valve springs and keep the valve in alignment, which needed rebuilding; and the bronze discharge valve seats, which also needed rebuilding at the top and bottom of their stems.

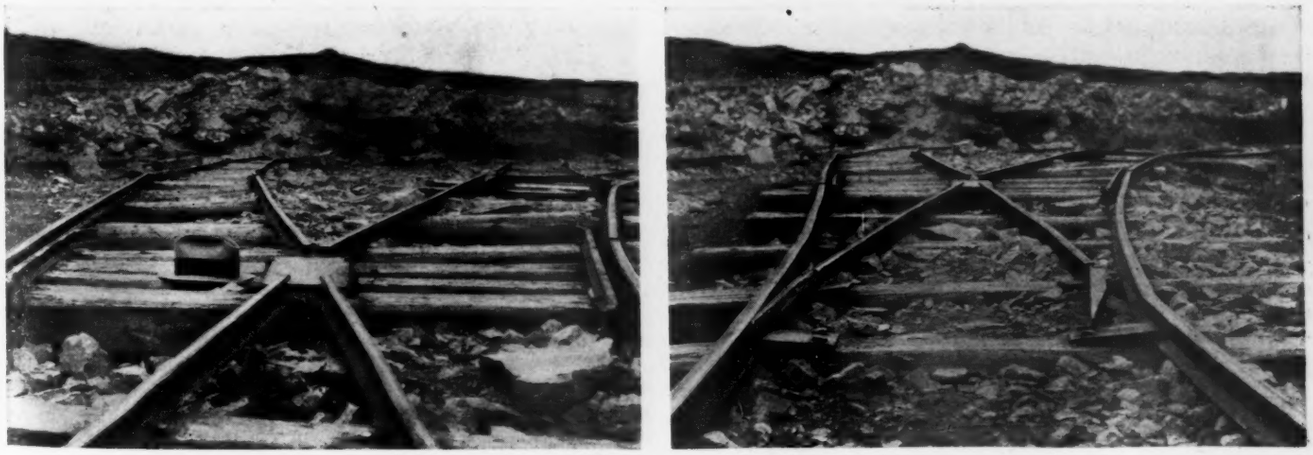
The first operation was to cut away the remaining ring sleeves from the casting and bevel the 4-in. holes in preparation for welding.

Before the casting was placed in the preheating furnace one of the threaded openings in the lower valve deck, which held an oversized suction seat and which had become worn, was built up with bronze and rethreaded to take a standard size suction seat. The old seat was oversized and had been placed in the casting during a former repair. It had been customary to scrap old casting when the oversized threading in the valve deck wore away, but by this ox-welded repair a new original size seat was placed in position. By this method of repair stock size fittings can always be used, thus eliminating the need of having oversized seats. A carbon block and carbon paste were used to protect the threads on the inside of this new seat opening while preheating.

The casting was then placed in the preheating furnace. Eight cast iron rough turned collars 4-in. overall diameter, with holes 2¾ in. in diameter, were placed on top of the pump casting and preheated with it.

The bronze suction seats in the lower valve deck were not removed but were allowed to remain in the casting while it was being preheated. The only precaution taken was to cover them with a heavy layer of loose asbestos. The usual careful methods of preheating were then followed.

While the casting was being heated, work was started on the accessory parts of the pump. The pump bucket, which corresponds to a piston in a steam pump, required new bronze rings. These rings, of which one is an integral part of the bucket and the other is an integral part of the rear facing of the bucket, had worn down. They were built up with bronze welding rod and machined to give a perfect fit. The compensating ring, also bronze, which fits over the bucket between the two other rings, was rebuilt in like manner.



For the little used quarry track several ingenious devices may be used for switching requirements

Propose Cut of 25 Million a Year in Federal Aid

THE House of Representatives' Committee on Roads, May 24, ordered favorably reported to the House the annual Federal-aid highway construction bill, carrying a $100,000,000 authorization for each of two fiscal years, 1933 and 1934, which is a reduction from the usual authorization of $125,000,000 annually, and also authorized reduced appropriation for forest roads and trails and over Indian and unappropriated land.

The bill, as approved, was introduced in the House by the chairman of the committee, Representative Almon, of Tuscumbia, Ala.

The bill (H. R. 12286) authorizes the $100,000,000 for the purpose of aiding the states in construction of rural post roads during the fiscal year ending June 30, 1934, and a similar sum is for the fiscal year ending June 30, 1935.

The bill stipulates that in apportioning the sums among the states and Hawaii for those fiscal years, deductions shall be made as reimbursement to the United States of the $80,000,000 emergency advance from which has been apportioned to them and used in road work, such deduction to be made at the rate of $16,000,000 each fiscal year.

It also authorizes to be appropriated for forest road trails, included in the totals already given, $7,500,000 for the fiscal year ending June 30, 1934, and $7,500,000 for the fiscal year ending June 30, 1935.

Also included in the totals is authority to appropriate $2,000,000 for the fiscal year ending June 30, 1933, for surveying, construction, reconstruction and maintenance of roads through unappropriated or unreserved public lands, nontaxable Indian lands or other Federal reservations other than the forest reservations, and an additional $2,000,000 for the next succeeding year, available until expended.

The bill would amend the present Federal-aid highway law of November 9, 1921, to provide as follows:

"Whenever provision has been made by any state for the completion and maintenance of 90 per centum of its system of primary or interstate and secondary or intercounty highways equal to 7 per centum of the total mileage of such states, as required by this act, said state, through its state highway department, by and with the approval of the Secretary of Agriculture, is hereby authorized to increase the mileage of the primary or interstate and secondary or intercounty systems by additional mileage equal to not more than 1 per cent. of said total mileage of such state, and thereafter to make like increases in the mileage of said system wherever provision has been made for the completion and maintenance of 90 per cent. of the mileage of such systems previously authorized in accordance herewith."

Motorists Pay Most of Nation's Highway Costs

ALTHOUGH PROPERTY TAXES are frequently credited with bearing most of the cost of building roads, the real burden is borne by motorists, an accurate survey of road costs shows.

At present motorists are paying 94.5% of the cost of building state highways and one-fourth of the cost of building local roads. Altogether motorists are paying about two-thirds of the cost of building state and local highways.

In 1930, the last year for which complete figures are obtainable, $1,423,164,000 was available for state highway construction. But of that sum $286,500,000 was left over from the previous year; Federal aid contributed nearly $92,500,000; bonds and notes financed by gasoline tax money accounted for $22,288,000; miscellaneous income brought in $17,000,000 and $60,600,000 was transferred from local authorities for state highway construction. So the actual amount of money coming from tax sources is $744,229,000. Of this only $43,318,000 came from property and $700,911,000 came from gasoline taxes and motor vehicle license fees. This latter amount is 94.5% of the total from tax sources.

In addition to paying nearly all of the costs of state roads, motorists are also paying one-fourth of the costs of building local roads. Tax sources in 1930 produced $656,656,000 for local roads. Of that motorists paid $162,022,000.

For both local and state roads, tax sources paid $1,400,884,000. Of that sum property taxes paid $537,951,000 and motorists paid $862,933,000, or approximately two-thirds.

It is logical and reasonable that motorists pay nearly all of the cost of state roads and also fair that they should contribute in part to the improvement of local roads, say economists. At present motorists are paying a just share, the figures indicate. In general one-fourth of the income from gasoline taxes and motor license fees revert to local roads. This is coincidental with the traffic local roads carry—one-fourth of the nation's total is over the local roads.

Road builders point out that local roads largely benefit local residents and obviously local communities should largely pay for their own roads. Local roads benefit more than just those who own automobiles. Good transportation is essential to the well-being of the entire country.

In general motor taxes are as high as good judgment dictates. To further increase taxes on motorists would be to handicap the most important means of transportation to the individual.

It is noteworthy that nearly all bonds issued by states are financed by gasoline tax income, and that there is a growing tendency on the part of counties to finance bond issues with gasoline tax refunds from the state. States and counties have discovered the fallacy of issuing bonds for the construction of road surfaces that will not outlast the term of the bonds. When road building first was speeded up many communities constructed inferior roads which needed replacement before the bonds were retired. Within recent years, however, the general tendency is to issue bonds only for the construction of concrete pavements which last upwards of 20 years.

Should Have Support of Rock Products Producers!

THE House of Representatives Committee on Banking and Currency, on May 20, ordered favorably reported the Luce bill (H. R. 7620) to provide for a system of home-loan banks with a capital of $125,000,000 for the purpose of giving financial support to home building. The measure was recommended early in the session by President Hoover.

The measure would provide for the creation of a Federal Home Loan Board of five members to be named by the President, which board would establish a system of from eight to 12 banks having an initial capital of $125,000,000.

Each of the banks would be required to begin with a minimum capital of at least $5,000,000, with the Reconstruction Finance Corporation making up the required subscription for the entire system.

Membership in the system would be opened to building and loan associations, cooperative banks, homestead associations, savings banks, trust companies, State banks and insurance companies. National banks are excluded since they already have access to the Corporation and Federal Reserve System. The members must subscribe 1% of mortgages eligible for collateral but not less than $1500.

Representative Luce, of Waltham, Mass., author of the bill, stated that he does not believe more than $60,000,000 of the Reconstruction Finance Corporation funds will be called for under the bill.

He declared, however, that it will, if enacted into law, prove the greatest of all the business relief measures suggested to date, since it affects so many people.

About 12,000,000 people have been members of home-loan associations, Mr. Luce said, 2,000,000 of whom are borrowers and the rest of whom are potential home owners. Many have announced their desire to withdraw their funds, and the associations would not be able to stand this withdrawal and remain in business.

Calcium Chloride in 1931

AN ADVANCE final summary of the salt, bromine and calcium chloride industry in 1931 has been issued by the Bureau of Mines. Statistics on production, consumption, imports and exports are given.

Editorial Comment

How to Get Credit?

We have been "called" on the editorial on the front cover of our May 21 issue: "Wanted—Some One To Use Credit." A lime manufacturer in the South would gladly spend money on plant improvement and wants specific information on how to get some of this credit that is said to be going begging. With an editor's and poet's license, we admit we were dealing in generalities, consequently we can't answer such inquiries specifically. Our answer is also a generality—that rock products producers should first get a price that will return the cost of the product, for until they do, it hardly is to be expected that bankers will consider them or their industry fair risks.

Self-Liquidating Investments!

The President of the United States, in his caustic and not very dignified "answer" to the petition sponsored by the American Society of Civil Engineers for an enlarged public works program, drew some fine distinctions between "self-liquidating" investments and those that are not. For example, a toll bridge project, really a speculation, is self-liquidating, but a bridge built by a state highway department from the sale of bonds, interest and sinking fund for which are provided for by gasoline taxes, apparently, within his definition, is not self-liquidating.

It has subsequently developed that the President's tirade against "pork barrel" public works was not intended specifically to be aimed at the dignified and constructive program of the American Society of Civil Engineers, of which the President himself is an honorary member, but was merely a general broadside on the subject; the president of the American Society of Civil Engineers merely touched off the match and became a more or less innocent victim.

For, as a matter of fact, the American Society of Civil Engineers and every other self-respecting organization and individual is against "pork barrel" public works, designed merely to spend money. On the other hand the members of the American Society of Civil Engineers and every other man familiar with the present paralysis of the construction industry knows that many meritorious public works are being held up for no other reason than the strike or fright of municipal and state bond buyers. The chief recommendation of the American Society of Civil Engineers, and of others who are earnestly trying to get *something* in the way of business started, was that the Government through the Reconstruction Finance Corporation, or some similar agency, try to assist the financing of these needed public works.

The President has the same idea in his reply, which would make it appear that he neither read the American Society of Civil Engineers' suggestions nor wrote the letter purporting to be his reply. The President also beclouds the issue by making a seemingly important distinction between the funds furnished by the Reconstruction Finance Corporation and a Federal bond issue. As a matter of fact, of course, the Reconstruction Finance Corporation's bonds are Federal Government bonds, and the rest of the capital of the Reconstruction Finance Corporation is furnished directly from the United States Treasury, which now has to sell short-term notes or bonds to get cash.

However, we are confident both the President and the Congress are rapidly approaching a point where they will agree on the Federal Government's helping finance *sound* public works, and that is all that any of us has asked for. The President, if we are charitable, has merely attempted to define *sound* as "self-liquidating" in order to differentiate more sharply between sound and pork barrel methods of public finance, and in that we should all sympathize.

It seems rather a good thing to us that the President has put so much emphasis on *self-liquidating*. For in times of stress like the present, every business concern, large and small, that has been operated on a conservative self-liquidating financial program is infinitely better able to face this crisis than those which borrowed freely and expected to keep on borrowing freely—as for example, the railways and the public utilities. Most, if not all of these types of business have been run on a financial plan which never contemplated paying off their original mortgage bonds. It was confidently expected that these could be refunded indefinitely. Too many small business enterprises have been run in the same cheerful way, as if the business was to be perpetual, or the present operators clever enough to get out from under in time to save theirs.

When our industries get back into a position where they again can make prices for their products, instead of accepting prices forced upon them, as they think now, it is to be hoped that the managers of these businesses will have sense enough to make prices that include ample reserve for depreciation, depletion and obsolescence to make these industries self-liquidating within a comparatively short period. For if this depression has proved anything, it has proved how uncertain are markets for basic materials, which we thought were as staple as bread and butter.

The President and the Congress also seem agreed that some hundreds of millions of Federal funds must soon be appropriated for direct relief of the unemployed. There will be some consolation for the construction industry, in that this Federal aid should save diversion of an equivalent amount of state highway gasoline tax funds. If the President and the Congress feel that Federal retrenchment in expenditures must include Federal aid for state highways, at least they can go on record in opposition to the illogical, probably illegal, *diversion* of any further funds specifically raised by taxation for highway construction.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	5-31-32	92	98	
Alpha P. C. com.[2]	5-28-32	6½	7½	25c qu. Apr. 25
Alpha P. C. pfd.[2]	5-28-32	.....	85	1.75 qu. June 15
Amalgamated Phosphate Co. 6's, 1936[19]	5-28-32	85	90	
American Aggregates com.[19]	5-28-32	1	3	
American Aggregates pfd.[19]	5-28-32	5	15	1.75 qu. Jan. 1
Amer. Aggr. 6's, w.w.[19]	5-28-32	29	35	
Amer. Aggr. 6's, ex.w.[19]	5-28-32	28	34	
Amer. L. & S. 1st 7's[27]	5-31-32	70	80	
American Silica Corp. 6½'s[39]	5-31-32	No market		
Arundel Corp. new com.	5-28-32	17½ actual sale		75c qu. Apr. 1
Bessemer L. & C. Class A	5-31-32	.....	4	
Bessemer L. & C. 1st 6½'s[4]	5-27-32	8	18	
Bloomington Limestone 6's[27]	5-31-32	.....	22	
Boston S. & G. new com.[37]	5-28-32	3	6	15c qu. Apr. 1
Boston S. & G. new 7% pfd.[37]	5-28-32	20	30	87½ qu. Apr. 1
California Art Tile, A	5-26-32	1½	4¼	
California Art Tile, B[9]	5-26-32	.....	5	
Calaveras Cement com.	5-26-32	⅛	2	
Calaveras Cement 7% pfd.	5-26-32	.....	60	1.75 qu. Apr. 15
Canada Cement com.	5-27-32	.....	3⅛	
Canada Cement pfd.	5-27-32	.....	31¾	1.62½ qu. June 30
Canada Cement 5½'s[42]	5-27-32	64	68	
Canada Crushed Stone bonds[42]	5-27-32	62	68	
Canada Crushed Stone com.[42]	5-27-32	1	.....	
Certainteed Products com.	5-31-32	1	1¾	
Certainteed Products pfd.	5-31-32	7	9½	1.75 qu. Jan. 1
Certainteed Products 5½'s	5-28-32	23⅛ actual sale		
Cleveland Quarries	5-27-32	.....	54	10c qu. June 1
Consol. Cement 1st 6½'s, A[44]	5-31-32	No market		
Consol. Cement notes, 1941[27]	5-31-32	No market		
Consol. Cement pfd.[27]	5-31-32	.....	46	
Consolidated Oka Sand and Gravel (Canada) 6½'s[32]	5-27-32	80	85	
Consolidated Oka Sand and Gravel (Canada) pfd.[42]	5-27-32	.....	50	1.75 qu. Oct. 10,'31
Consol. Rock Prod. com.[35]	5-26-32	10c	20c	
Consol. Rock Prod. pfd.[35]	5-26-32	35c	65c	
Consol. Rock Prod. units[35]	5-26-32	¾	1½	
Consol. S. & G. pfd. (Can.)	5-27-32	.....	50	1.00 qu. May 16
Construction Mat. com.	5-31-32	.....	⅞	
Construction Mat. pfd.	5-31-32	.....	2½	
Consumers Rock and Gravel, 1st Mtg. 6's. 1948[35]	5-26-32	31	34	
Coosa P. C. 1st 6's[23]	5-27-32	15	30	
Coplay Cem. Mfg. 1st 6's[38]	5-27-32	60	.....	
Dewey P. C. com.[47]	5-31-32	75	80	
Dolese and Shepard	5-31-32	14	16	$1 qu. Jan. 1
Dufferin Pav. & Cr. Stone pfd.	5-27-32	.....	30	1.75 qu. Apr. 1
Dufferin Pav. & Cr. Stone com.	5-27-32	.....	5	
Edison P. C. com.[10]	5-14-32	.....	1⅙	
Edison P. C. pfd.[10]	5-14-32	.....	25	
Federal P. C. 6½'s, 1941[19]	5-28-32	35	45	
Giant P. C. com.[2]	5-28-32	1	3	
Giant P. C. pfd.[2]	5-28-32	4	8	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	5-27-32	2½	2⅝	10c qu. Oct. 5,'31
Gyp. Lime & Alabastine 5½'s[43]	5-27-32	48	52	
Hermitage Cement com.[11]	5-28-32	3	6	
Hermitage Cement pfd.[11]	5-28-32	25	30	
Ideal Cement 5's, 1943[29]	5-28-32	80	85	
Ideal Cement com.	5-31-32	15	17	50c qu. Apr. 1
Indiana Limestone units[27]	5-31-32	No market		
Indiana Limestone 6's	5-28-32	5 actual sale		
International Cem. com.	5-31-32	3¼	4	50c qu. Mar. 31
International Cem. bonds, 5's	5-31-32	43 actual sale		Semi-ann. int.
Kelley Is. L. & T. new stock	5-31-32	.....	8	25c qu. Apr. 1
Ky. Cons. Stone com.	5-27-32	.....	2	
Ky. Cons. Stone pfd.	5-27-32	.....	50	
Ky. Cons. St. 1st Mtg. 6½'s[45]	5-26-32	15	20	
Ky. Cons. St. V. T. C.[45]	5-26-32	½	1	
Ky. Rock Asphalt com.	5-27-32	1¾	2½	
Ky. Rock Asphalt pfd.	5-27-32	20	25	1.75 qu. Dec. 1,'31
Ky. Rock Asphalt 6½'s	5-27-32	.....	70	
Lawrence P. C.[2]	5-28-32	7	11	
Lawrence P. C. 5½'s, 1942[2]	5-28-32	25	30	
Lehigh P. C. com.	5-31-32	3¾	4	
Lehigh P. C. pfd.	5-31-32	49	50	1.75 qu. July 1
Louisville Cement[5]	5-26-32	60	80	
*Lyman-Richey 1st 6's, 1932[13]	5-27-32	95	.....	
Lyman-Richey 1st 6's, 1935[13]	5-27-32	90	.....	
Marblehead Lime 6's[14]	5-27-32	No market		
Marbelite Corp. com.[35] (cement products)	5-26-32	3c	.....	
Marbelite Corp. pfd.[35]	5-26-32	50c	.....	
Marquette Cem. Mfg. 1st 5's, 1936[16]	5-31-32	80	.....	
Marquette Cem. Mfg. 1st 6's, 1936[16]	5-31-32	85	.....	
Material Service Corp.	5-31-32	.....	10	
McCrady-Rodgers 7% pfd.[22]	5-26-32	30	34	87½c qu. Dec. 30,'31
McCrady-Rodgers com.[22]	5-26-32	5	10	75c qu. Jan. 26
Medusa P. C. pfd.[47]	5-31-32	50	55	1.50 qu. Apr. 1
Medusa P. C. com.	5-31-32	5	8	
Monarch Cement com.[47]	5-31-32	50	55	
Michigan L. & C. com.[6]	5-28-32	45	.....	
Missouri P. C.	5-28-32	5	5½	25c qu. Jan. 30
Monolith Portland Midwest com.[9]	5-26-32	¾	1	
Monolith P. C. com.[9]	5-26-32	½	1	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	5-26-32	1⅛	2	40c s.-a. Jan. 1
Monolith P. C. units[9]	5-26-32	2¾	5	
Monolith P. C. 1st Mtg. 6's[9]	5-26-32	55	60	
National Cem. (Can.) 1st 7's[27]	5-31-32	80	90	
National Gypsum A com.[27]	5-31-32	½	1½	
National Gypsum pfd.[27]	5-31-32	20	25	1.75 qu. July 1
National Gypsum 6's[3]	5-31-32	50	55	
Newaygo P. C. 1st 6½'s[27]	5-31-32	72	.....	
New England Lime 6's, '35[14]	5-27-32	10	15	
N. Y. Trap Rock 1st 6's	5-28-32	60¼ actual sale		
N. Y. Trap Rock 7% pfd.[10]	5-14-32	10	.....	1.75 qu. Apr. 1
North Amer. Cem. 1st 6½'s	5-31-32	11½ actual sale		
North Amer. Cem. com.[27]	5-31-32	.....	3	
North Amer. Cem. 7% pfd.[27]	5-31-32	2	4	
North Shore Mat. 1st 5's[15]	5-31-32	35	.....	
Northwestern States P. C.[47]	5-31-32	24	26	
Ohio River S. & G. com.	5-27-32	.....	8	
Ohio River S. & G. 7% pfd.	5-27-32	.....	98	
Ohio River S. & G. 6's[16]	5-27-32	.....	70	
Oregon P. C. com.[9]	5-26-32	8	12	
Oregon P. C. pfd.[9]	5-26-32	80	85	
Pacific Coast Aggr. com.[40]	5-26-32	.....	½	
Pacific Coast Aggr. pfd.[40]	5-26-32	.....	1	
Pacific Coast Aggr. 6½'s, 1944[5]	5-26-32	15	18	
Pacific Coast Aggr. 7's, 1939[5]	5-26-32	2	4	
Pacific Coast Cement 6's[5]	5-26-32	60	.....	
Pacific P. C. com.	5-26-32	2	6	
Pacific P. C. pfd.	5-26-32	.....	50	1.62½ qu. Apr. 5
Pacific P. C. 6's	5-26-32	.....	94	
Peerless Cement com.[1]	5-27-32	15c	30c	
Peerless Cement pfd.[1]	5-27-32	1	3	
Penn.-Dixie Cement com.	5-31-32	½	⅝	
Penn.-Dixie Cement pfd.	5-31-32	3½	4	
Penn.-Dixie Cement 6's	5-31-32	25 actual sale		
Penn. Glass Sand Corp. pfd.[19]	5-14-32	60	70	1.75 qu. Apr. 1
Penn. Glass Sand Corp. 6's[19]	5-28-32	65	.....	
Petoskey P. C.	5-31-32	1¼	2	
Port Stockton Cem. com.[9]	5-26-32	No market		
Riverside Cement com.[9]	5-26-32	.....	12	
Riverside Cement pfd.[9]	5-26-32	55	60	1.50 qu. Feb. 1
Riverside Cement, A	5-26-32	.....	8	
Riverside Cement, B[9]	5-26-32	70c	1	
Roquemore Gravel 6½'s[17]	5-27-32	80	95	
Sandusky Cement 6½'s, 1932-37[19]	5-14-32	80	90	
Santa Cruz P. C. com.	5-26-32	.....	60	$1 qu. Apr. 1
Schumacher Wallboard com.	5-26-32	1.05	.....	
Schumacher Wallboard pfd.	5-26-32	.....	8	50c qu. May 15
Signal Mt. P. C. pfd.[47]	5-31-32	5	10	
Southwestern P. C. units[35]	5-26-32	150	200	
Standard Paving & Mat. (Canada) com.[42]	5-27-32	1	2	
Standard Paving & Mat. pfd.[42]	5-27-32	.....	20	1.00 qu. May 16
Superior P. C., A[9]	5-26-32	23	27	27½c mo. June 1
Superior P. C., B[9]	5-26-32	4	5¼	12½c Mar. 21
Trinity P. C., units[47]	5-31-32	20	25	
Trinity P. C. com.[47]	5-31-32	3	5	
Trinity P. C. pfd.[47]	5-31-32	18	22	
U. S. Gypsum com.	5-31-32	13	13¼	40c qu. June 30
U. S. Gypsum pfd.	5-31-32	92	108	1.75 qu. June 30
Wabash P. C.[21]	5-27-32	6	8	
Warner Co. com.[16]	5-27-32	1¾	2	25c qu. Oct. 15,'31
Warner Co. 1st 7% pfd.[16]	5-27-32	30	50	1.75 qu. Apr. 1
Warner Co. 6's, 1944, with war.	5-27-32	.....	58⅞	
Whitehall Cem. Mfg. com.[19]	5-14-32	.....	16	
Whitehall Cem. Mfg. pfd.[19]	5-14-32	.....	50	
Wiscon. L. & C. 1st 6's, '33[13]	5-31-32	25	30	
Wolverine P. C. com.	5-31-32	.....	3¼	15c qu. Nov. 15,'31
Yosemite P. C. A. com.[9]	5-26-32	1	1½	

*Called June 1 at $100.

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Wick & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [13]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central-Republic Bk. & Tr. Co., Chicago. [16]G. M. P. Murphy & Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]Howard R. Taylor & Co., Baltimore. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher-Newton & Co., Denver. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomson & Co., Toronto. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky. [46]First Union Trust & Savings Bank, Chicago. [47]Anderson Plotz and Co., Chicago, Ill.

American Lime and Stone Co.'s Report

THE ANNUAL REPORT of the American Lime and Stone Co., Bellefonte, Penn., for the year ended December 31, 1931, is reported as follows:

INCOME ACCOUNT

	1931	1930
Net sales	$976,090	$1,431,205
Manufacturing, operating, general expenses, etc.	805,355	1,105,939
Depreciation and depletion	120,084	168,763
Operating income	50,651	156,503
Other income	36,104	35,952
Total income	86,755	192,455
Interest	81,181	86,389
Surplus	$5,574	$106,066
Times interest earned	1.07	2.23
Earned per share, preferred	$0.80	$15.15

Number of preferred shares, 7,000.

BALANCE SHEET, AS OF DECEMBER 31

Assets:	1931	1930
*Land, buildings, etc.	$2,077,026	$2,013,420
Current assets:		
Inventories (net)	111,926	138,178
Receivable and securities (net)	185,850	226,911
Cash	28,434	48,891
Sinking fund cash	34,726	34,373
Compensation insurance fund	23,981	42,746
Deferred charges	95,802	127,974
Total	$2,557,745	$2,632,494
Liabilities:		
Preferred stock	$700,000	$700,000
Common stock	500,000	500,000
Bonded debt	988,000	1,071,000
Current liabilities:		
Accounts payable, etc.	20,965	32,048
Sundry reserves	24,235	18,463
Surplus and undivided profits	324,545	310,983
Total	$2,557,745	$2,632,494
Current assets	$326,210	$413,980
Current liabilities	20,965	32,048
Working capital	$305,245	$381,932

*After depreciation: 1931, $922,539; 1930, $998,493.

Arundel Corp. Earnings

THE Arundel Corp. (sand, gravel and contracting), Baltimore, Md., reports for four months ended April 30, 1932, net profit of $493,283 after depreciation, federal taxes, etc., equivalent to $1 a share on 492,556 no-par shares of capital stock. This compares with $646,124 or $1.31 a share in first four months of 1931.

April net profit was $114,971 after depreciation, federal taxes, etc., against $239,985 in April, 1931.

Current assets as of April 30, 1932, were $3,407,867, which does not include the $2,000,000 owed the company by the state of Florida, and current liabilities were $292,296.

International Cement Omits Dividend on Common

THE directors of the International Cement Corp., New York City, on May 25 voted to omit the quarterly dividend usually payable about June 30 on the outstanding 636,171 shares of common stock, no par value. A distribution of 50c. per share was made on this issue on March 31 last as compared with 75c. per share on December 31, 1931, and quarterly payments of $1 per share from December 31, 1923, to and including September 30, 1931. A 10% stock dividend was also paid on December 31, 1924.

Coplay Cement Report

THE Coplay Cement Manufacturing Co., Coplay, Penn., reports for the years ended December 31:

CONSOLIDATED INCOME ACCOUNT

	1931	1930
Sales	Not stated	$1,955,897
Cost of sales	.....	1,740,148
Depreciation and depletion	$140,527	241,591
Operating loss	198,681	25,842
Interest	22,186	22,779
Deferred charges, adjustments, etc.	39,568	56,403
Deficit for year	$260,435	$105,024

CONSOLIDATED BALANCE SHEET

Assets:	1931	1930
*Lands, plants, etc.	$3,551,567	$3,534,951
Slow moving assets	50,665	72,933
Current assets:		
Inventories	285,941	365,567
Cash	171,447	190,426
Notes and accounts receivable	125,049	155,745
Deferred charges	83,346	93,593
Total	$4,268,014	$4,413,215
Liabilities:		
Preferred stock	$984,400	$984,400
Common stock	2,000,000	2,000,000
Bonded debt	364,400	373,700
Current liabilities:		
Accounts payable and accruals	41,651	52,778
Reserves	50,000	50,000
Surplus	827,563	952,337
Total	$4,268,014	$4,413,215
Current assets	$582,437	$711,738
Current liabilities	41,651	52,778
Working capital	$540,786	$658,960

*After depreciation and depletion: 1931, $2,149,881; 1930, $2,132,343.

United States Gypsum

DESPITE continued decline in construction in the United States, U. S. Gypsum Co., Chicago, Ill., according to present indications, will report net profits for the first half of 1932 somewhat in excess of preferred and common dividend requirements. This means net for the first six months of around $1,300,000, equivalent after preferred dividends to about 80 c. a share on 1,217,472 common shares outstanding, against $2,241,560 or $1.62 a share on 1,216,956 shares in the first half of 1931.

Since March 1 the company's business has been nearly equal to that of the like 1931 period. In the first quarter its profits were slightly less than preferred dividend requirements. However, that period normally is the dullest season for the gypsum industry and even in U. S. Gypsum's best years its profits in first quarters were not large.

In recent years the company has perfected several products for use in modernizing and repairing buildings and for use outside the building field, the combined volume of which will stand it in good stead this year during the general slump in new construction.

Recent Dividends Announced

Alpha Portland Cement pfd. (qu.)	1.75	June 15
Canada Cement 6½% pfd. (qu.)	1.62½	June 30
Lehigh Portland Cement pfd. (qu.)	1.75	July 1
National Gypsum pfd. (qu.)	1.75	July 1

Signal Mountain Cement

THE Signal Mountain Portland Cement Co., Chattanooga, Tenn., reports for the years ended December 31:

INCOME ACCOUNT

	1931	1930
Revenue	$894,684	$922,721
Operating expenses, etc.	818,591	844,423
Depreciation	134,496	135,963
Operating deficit	$58,401	$57,665

BALANCE SHEET, AS OF DECEMBER 31

Assets	1931	1930
*Plant, equipment, etc.	$2,069,664	$2,186,787
Investments, etc.	35,001	27,001
Current assets:		
Inventories	283,140	314,485
Notes and accounts receivable	52,900	78,996
Cash	495,125	419,158
Deferred charges	13,130	25,580
Total	$2,948,960	$3,052,007
Liabilities:		
Preferred stock	$2,500,000	$2,500,000
†Common stock	1	1
Deficit	70,068	11,667
Funded debt	476,500	522,000
Current liabilities:		
Accounts payable	18,569	21,309
Accounts accrued	23,958	20,364
Total	$2,948,960	$3,052,007
Current assets	$831,165	$812,639
Current liabilities	42,527	41,674
Working capital	$788,638	$770,965

*After depreciation: 1931, $931,782; 1930, $797,287. †Represented by 30,000 no par shares.

Marblehead Lime Company

THE Marblehead Lime Co., Chicago, Ill., reports for the fiscal year ended November 30, 1931:

INCOME ACCOUNT

	1931	1930
Net profit	$38,992	$67,832
Other income	6,931	10,446
Total income	45,923	78,278
Interest	32,219	35,759
*Balance	$13,704	$42,519

*Before federal taxes, depreciation and depletion.

BALANCE SHEET

Assets:	1931	1930
*Lime deposits, buildings, etc.	$1,524,579	$1,580,413
Current assets:		
Cash	56,601	67,324
Receivables	36,346	35,523
Inventories	115,658	162,495
Cash value, life insurance	29,091	25,036
Due on stock subscription	18,900	18,900
Investments	7,717	4,836
Other assets	3,667	3,666
Deferred charges	38,360	59,371
Total	$1,830,919	$1,957,564
Liabilities:		
Preferred A stock	$11,500	$11,500
Preferred B stock	331,500	331,500
†Common	768,514	768,514
Funded debt	533,000	566,000
Current liabilities:		
Accounts and notes payable	69,906	106,963
Accrued interest, taxes, etc.	29,711	27,170
Surplus	86,788	145,917
Total	$1,830,919	$1,957,564
Current assets	$237,696	$290,378
Current liabilities	99,617	134,133
Working capital	$138,079	$156,245

*After depletion and depreciation. †Represented by 14,000 no par shares.

Warner Co. Defers Dividend on Preferred Stock

THE Warner Co., Philadelphia, Penn. (lime, sand and gravel), has deferred action on the quarterly dividend of $1.75 on the $7 first preferred cumulative stock, due at this time.

Traffic and Transportation

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week ending May 28:

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

25302. **Sand, common** (not molding, fire, filter or blasting); **crushed stone** (Crushed stone rate now applies and is herein proposed to apply from Westfield only.) and **gravel**, in straight or mixed carloads (See Note 3), from North Wilbraham and Westfield, Mass., to Pittsfield and West Pittsfield, Mass. Present, $1 per net ton; proposed, 80c. Reason—To establish rate which will secure movement for rail carrier versus handling direct from nearby pit to job.

25375. **Limestone, agricultural, broken or unburnt, ground,** minimum weight 50,000 lb., from Ashley Falls, Mass., to Sherman and Limestone, Maine.

To	Pres.	Prop.
Sherman, Me.	35	26½
Limestone, Me.	39½	33½

Reason—To establish rates comparable with rates in effect to Northern Maine Jct., Me.

25384. **Stone, agricultural, ground,** from Byron and Houghton, Me., to stations on the N. Y. N. H. & H. R. R. Present, sixth class; proposed, 1c per 100 lb. over rates on lime, in carloads, from Rockland, Me., to N. H. R. R. territory in Items 200A and 205A, I.C.C. No. C-4270. (See Note 5.)

TRUNK LINE ASSOCIATION DOCKET

28814. Cancel rate of $2.75 per net ton on **engine, blast and molding sand**; also **ground flint**, carloads, from Hancock, Berkeley Springs and Great Cacapon, W. Va., to Bradford, Penn.

29190. **Sand, damp** (not artificially or mechanically dried), carloads (See Note 2), from Cascade, Sturgisson and Greer, W. Va., to Fairmont, W. Va., 70c per net ton. Reason—Proposed rate is the same as now published on sand, other than blast, engine, foundry, etc., between same points.

29195. **Sand**, other than blast, engine, fire, foundry, glass, molding, quartz, silex or silica, carloads (See Note 2), from York, Penn., to Spahr, Md., $1.30; from Texas, Md., to Spahr, Md., $1.65, and from York, Penn., to Frederick, Md., 90c per net ton. (See Note 5.)

29197. (a) **Sand**, other than blast, core, engine, fire, glass, grinding, molding, quartz, silex or silica, and **gravel**; (b) **crushed stone; screenings, crushed stone and crushed stone tailings**; (c) **slag**, not ground or pulverized, in bulk, in open top equipment. (See Note 2.)

From a, Machias, N. Y.; a, Springville, N. Y.

To	Proposed rates
Nansen, Penn.	110
Russell City, Penn.	110
Chaffee, Penn.	110
Marienville, Penn.	110

From b. Lime Rock, N. Y.; b, Le Roy, N. Y.; a, b, c, Buffalo, N. Y.

To	Proposed rates
Nansen, Penn.	120
Russell, City, Penn.	120
Chaffee, Penn.	120
Marienville, Penn.	130

Rates in cents per net ton. (See Note 5.)

28488. **Cancel commodity rates on broken stone,** carloads, from Blissville Docks, N. Y., to points on the Long Island railroad as shown on pages 33 and 34 of Long Island railroad I. C. C. 887.

Sup. 1 to 28702. **(A) Stone, crushed or quarry broken,** carloads; (B) **crushed stone screenings,** carloads (See Note 2), to Carbondale, Penn., from White Haven, Penn., (A) $1.20, Auburn, N. Y., (A) $1.75, and Oaks Corners, N. Y., (A) and (B), $1.75 per net ton.

Sup. 1 to 29079. **Sand,** N. O. I. B. N. in O. C., carloads, **(A)** in open top equipment and (B) in box cars or other closed equipment (See Note 2), from Downer, Williamstown and Williamstown Junction, N. J., to Newport News, Va., (A) $4.15 and (B) $4.50 per net ton.

29186. **Sand, building and engine,** in open top equipment, carloads (See Note 2), from Hancock, Berkeley Springs and Great Cacapon, W. Va., to Monessen, Donora, Clairton, Large, Bruceton, Long View, Castle Shannon, West Liberty and Rook, Penn., $1.80 per net ton. (See Note 5.)

28187. **Crushed stone,** carloads (See Note 2).

To	From York, Penn. Prop. rate	From Campbell, Penn. Prop. rate
Springvale, Penn.	90	90
Brownton, Penn.	90	90
Felton and Brogueville, Penn.	90	95
Laurel, High Rock, Muddy Creek Forks, Penn.	95	95
Bruce, Bridgeton, Woodbine, South Side, Penn.	95	100
Castle Fin, Bryansville and Delta, Penn., Cardiff, Slate Hill, Whiteford, Pylesville	100	105
Street, Minefield, Rocks and Fern Cliff, Md.	105	110
Sharon, Forest Hill and Bynum, Md.	105	110
Bel Air and Vale, Md.	110	110
Fallston, Laurel Brook and Baldwin, Md.	110	125
Rutledges, Hyde, Long Green, Glen Arm, Md.	125	125
Notchcliff and Summerfield, Md.	125	.....
Loch Raven, Md.	125	135
Oakleigh, Towson Heights, Towson, Md.	135	135
Sheppard, Md.	135	135
Woodbrook, Homeland and Notre Dame, Md.	135	145
Evergreen and Baltimore, Md.	135	145

Rates in cents per net ton. (See Note 5.)

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—To meet motor truck competition.

Note 5—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

29204. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads, also **gravel,** carloads (See Note 2), from Patuxent, Md., to Collington, Md., 65c; Mulliken to Fall, Md., 70c; Leeland to Hills, Md., 70c; Marlboro, Md., 70c; Croome to Cheltenham, Md., 75c; Brandywine to White Plains, Md., 80c; La Plata to Popes Creek, Md., 90c, being proposed rates in cents per net ton. Reason—Proposed rates compare favorably with rates from Arundel, Md., to Hall, Cheltenham, Bentley, Md., etc.

29209. To add Syracuse, N. Y., as an origin point to all tariffs on **crushed stone,** now in effect from Jamesville, N. Y., and Rock Cut, N. Y., to points on the D. L. & W. R. R. and connections, viz., Erie R. R., L. V. R. R., N. Y. O. & W. Ry., D. & H. R. R., D. & N. R. R., L. & W. V. Ry., B. & O. R. R. (B. R. & P. Div.), C. R. R. of N. J., C. & P. A. R. R., L. & N. E. R. R., P. S. & N. R. R., S. N. Y. Ry. and U. V. Ry.

29211. **Crushed stone and stone screenings,** carloads (See Note 2), from Havre de Grace, Md., to Highfield to Waynesboro, Penn., incl., $1.40 per net ton. Reason—Proposed rate is same as proposed to Flint, Md.

29216. **Sand, blast, engine, foundry, glass, molding, quartz, silex or silica,** carloads (See Note 2), from Tatesville, Penn., to Johnstown, Penn., $1.53 per net ton. Present rate, $1.62 per net ton. Reason—Proposed rate is same as in effect from the Mapleton district.

29217. **Crushed stone,** carloads (See Note 2), from Bound Brook, N. J., to Wilkes-Barre, Penn., $1.30 per net ton. Present rate $1.60 per net ton. (See Note 5.)

29218. **Sand** (other than blast, engine, foundry, glass, molding or silica) and **gravel,** carloads (See Note 2), from Wadsworth, N. Y., to Aurora, N. Y., $1 per net ton. Present rate, $1.10 per net ton. (See Note 5.)

29224. **Sand, blast, engine, fire, foundry, glass, molding, silex and silica,** carloads (See Note 2), from Lehighton, Penn., to Kingston, Wyoming, West Pittston and Dickson, Penn., $1.53 per net ton. (See Note 5.)

29225. **Limestone** (other than finely ground), carloads (See Note 2), from Cedar Hollow, Exton, Mill Lane, Plymouth Meeting, Swedeland and Williams, Penn., to Manville, N. J., $1.40 per net ton. (Present rate, $1.40.) (See Note 5.)

29226. **Stone, natural** (other than bituminous asphalt rock), **crushed,** carloads (See Note 2), from Marlboro, N. Y., to Blooming Grove, N. Y., 90c, and Harriman, Oxford and Monroe, N. Y., $1 per net ton. Reason—Proposed rates are comparable with rates to Central Valley and Tuxedo, N. Y.

29227. To establish on **marble or stone chips or granules,** also on **marble or stone dust,** carloads, from M. & P. R. R. stations, Cardiff, Md., Delta, Penn., Slate Hill, Penn., and Whiteford, Md., to Westmont, N. J., 15c per 100 lb. Rate subject to emergency charges per Agent Curlett's Tariff I. C. C. No. A367. Reason—Proposed rate is comparable with rate to Camden, N. J.

29228. **Crushed stone,** carloads (See Note 2), from Pompton Lakes, N. J., to Narrowsburg, N. Y., $1.40 per net ton. (See Note 5.)

29234. **Stone, crushed or broken,** carloads, from Munns, N. Y., to Binghamton, Chenango Bridge, Chenango Forks, Willards, Greene, Brisben, Coventry, Haynes, Norwich, Galena, Sherburne and Hubbardsville, N. Y., $1.10 per net ton. Reason—Proposed rate is comparable with rate from Jamesville, N. Y.

29235. **Gravel and sand** (other than blast, engine, fire, glass, molding or foundry, quartz, silex and silica), carloads (See Note 2), from Bowie Road, Pasadena and Bragers, Md., to stations on the Western Maryland Ry.—State Line, Penn., Lap, Md., Frostburg, Md., Garrett, Bell, Penn., Chiefton, W. Va., Connellsville, Penn., Henry, Tunnel, Durbin, Norton, Blue Spring, Webster Springs, W. Va., and various. Rates ranging from $1.70 to $2.60 per net ton. (See Note 5.)

28814. To cancel rate of $2.75 per net ton on **sand, engine, blast, molding and glass**; also **ground flint**, carloads, from Western Maryland Railway Hancock-Round Top district to Bradford, Penn.

29248. **Stone, natural** (other than bituminous asphalt rock), **crushed,** carloads, in shipping containers loaded on container cars, minimum weight 80,000 lb., from Marlboro, N. Y., to Walden, N. Y., 90c per net ton, subject to same rules as published in W. S. R. R. Tariff I. C. C., W. S. No. 6726. Reason—Proposed rate is same as applicable to ordinary service.

29250. **Stone, crushed, coated with oil, tar or asphaltum,** carloads (See Note 2), from Martinsburg, W. Va., to B. & O. R. R. stations, Grafton, Boulder, Belington, Centralia, Gauley Mill, Richwood, Jarrett's Ford, Falling Rock, Dundon, Gassaway, Randolph Mine and various. Rates ranging from $1.60 to $2.30 per net ton. (See Note 5.)

29086. **Stone, natural** (other than bituminous asphalt rock), **crushed,** carloads (See Note 2), from Auburn, N. Y., to Leolyn, Penn., $1.50 per net ton. Rate to be held at intermediate points back to Fassett, Penn.

29175. (a) **Building sand,** carloads, (b) **sand, blast, engine, foundry, molding, silica, quartz or silex,** carloads, and (c) **glass sand,** carloads (See Note 2), to Newark Valley, N. Y., from Hancock-Berkeley Springs district, (a) $2.70, and (b) and (c), $3.10 per net ton. From Gore-Triplett, Va., (c) $3.10 per net ton.

29253. **Stone, natural** (other than bituminous asphalt rock), **crushed,** carloads, in shipping containers loaded on container cars, minimum weight 110,000 lb., from Marlboro, N. Y., to Newburgh, N. Y., 60c per net ton, subject to same rules as published in W. S. R. R., I. C. C., W. S. No. 6726, and to include transfer at Newburgh from cars by crane. Reason—Proposed rate is same as applicable when in ordinary service.

28254. **Limestone,** carloads (See Note 2), from Annville, Brownstone, Hummelstown, Myerstown, Palmyra and Swatara, Penn., to L. & N. E. R. R. stations, Martins Creek, Sandts Eddy, Stockertown, Bath, Portland Mills, Hercules, Nazareth, Penn Allen, Bath Jct., and Bath, Penn., and N. & B. R. R. stations, Bath, Navarro and Northampton, Penn., $1.30 per gross ton. Reason—Proposed rate is comparable with rates from Lebanon, Valley District to Vulcanite, N. J., Northampton, Cementon, Coplay, Penn., etc.

29256. **Gravel and sand, carloads** (other than blast, engine, foundry, glass, molding or silica), (See Note 2), from Alfred, N. Y., to Bennetts, N. Y., 80c per net ton. (Present rate, 90c.) Rea-

son—Proposed rate is comparable with rate to Paynesville, Ellisburg, N. Y., and Shingle House, Penn.

CENTRAL FREIGHT ASSOCIATION DOCKET

31489. To establish on **stone, crushed** (in bulk), **crushed stone screenings** (in bulk) and **limestone unburned** (agricultural) (in bulk, in open top cars), carload, from Genoa, Martin, Marblehead, Bellevue and Sandusky, O., to points in Pennsylvania and Ohio (representative points and rates shown in Exhibit B).

EXHIBIT B

To (rep. pts.)	From Genoa and Martin, O. Pres. rates	Prop. rates
B. & L. E. R. R. (Via N. Y. C. R. R., Osgood, Penn., and B. & L. E. R.R.)		
Albion, Penn.	(3)	170
Greenville, Penn.	(3)	160
Erie R. R. (Via N. Y. C. R. R., Cleveland, O., and Erie R. R.)		
Corry, Penn.	(3)	180
Meadville, Penn.	(3)	170
Franklin, Penn.	(3)	180
Braceville, O.	176	160
Warren, O.	176	160
Phalanx, O.	.....	.....
N. Y. C. R. R. (Via N. Y. C. R. R. direct)		
Franklin, Penn.	(3)	150
Andover, O.	.....	.....

To (rep. pts.)	From Bellevue O. Pres. rates	Prop. rates
B. & L. E. R. R. (Via N. Y. C. R. R., Osgood, Penn., and B. & L. E. R. R.)		
Albion, Penn.	(3)	160
Greenville, Penn.	(3)	150
Erie R. R. (Via N. Y. C. R. R., Cleveland, O., and Erie R. R.)		
Corry, Penn.	(3)	170
Meadville, Penn.	(3)	160
Pulaski, Penn.	(3)	150
N. Y. C. R. R. (Via N. Y. C. R. R. direct)		
Franklin, Penn.	(3)	140

To (rep. pts.)	From Marblehead, O. Pres. rates	Prop. rates
B. & L. E. R. R. (Via N. Y. C. R. R., Osgood, Penn., and B. & L. E. R. R.)		
Albion, Penn.	(3)	170
Greenville, Penn.	(3)	150
Erie R. R. (Via N. Y. C. R. R., Cleveland, O., and Erie R. R.)		
Corry, Penn.	(3)	180
Meadville, Penn.	(3)	160
Franklin, Penn.	(3)	170
Braceville, O.	.....	.....
Warren, O.	.....	.....
Phalanx, O.	151	150
N. Y. C. R. R. (Via N. Y. C. R. R. direct)		
Franklin, Penn.	(3)	150
Andover, O.	151	150

To (rep. pts.)	From Sandusky, O. Pres. rates	Prop. rates
B. & L. E. R. R. (Via N. Y. C. R. R., Osgood, Penn., and B. & L. E. R. R.)		
Albion, Penn.	(3)	160
Greenville, Penn.	(3)	150
Erie R. R. (Via N. Y. C. R. R., Cleveland, O., and Erie R. R.)		
Corry, Penn.	240	170
Meadville, Penn.	240	150
Pulaski, Penn.	(3)	150
N. Y. C. R. R. (Via N. Y. C. R. R. direct)		
Franklin, Penn.	220	140

(3) Sixth class, per Official Classification.

31490. To establish on **stone,** viz., **quarry, waste** or **tailings,** carloads, minimum weight 120,000 lb., from Sibley, Mich., to Cement City, Mich., 60c per net ton. Present rate, 70c.

31492. To establish on **stone, crushed, crushed stone screenings** (in bulk, in open top cars), in carloads, from Painesville and Perry, O., to Mill Village, Penn., 110c per net ton, emergency charge in addition. Present rate, 320c per net ton (sixth class per O. C.).

31483. To establish on **crushed stone,** in open top cars, carloads, from McVittys, O., to Adams Mill, O., $1 per net ton subject to emergency tariff. Present, 17c cwt.

31507. To establish on **crushed stone,** carloads. To points in Michigan:

FROM ALPENA, MICH.

	Prop. rate	Pres. rate		Prop. rate	Pres. rate
Alma	1.32	1.51	Mt. Clemens	1.47	1.80
Blissfield	1.60	1.85	Owosso	1.32	1.51
Caro	1.27	1.50	Sebewaing	1.32	1.51
Holland	1.52	1.77	St. Louis	1.32	1.51
Lansing	1.37	1.51			

TO CALCITE, MICH.

	Prop. rate	Pres. rate		Prop. rate	Pres. rate
Blissfield	1.65	1.90	Lansing	1.42	1.51
Holland	1.57	1.82	Sebewaing	1.37	1.51

31508. To establish on **sand and gravel,** carloads, minimum weight, from Cleveland, O., to Aurora, O., 70c. Present rate, 80c.

31509. To establish on **sand,** viz., lake, river and bank, other than loam, carloads, from Gary, Calumet and Willow Creek, Ind., to Aurora, Ind., 239c per net ton. Present, class rates. Route—Wabash Ry., New Paris, Ind., C. C. C. & St. L. Ry.

31510. To establish on **crude dolomite, glass sand, ground limestone,** carloads, from Mt. Vernon, O., to Clarksburg, W. Va., *††‡225 per net ton. Present—(a) 21 cwt., (b) 18 cwt.

‡Minimum weights—Crude dolomite and glass sand (See Note 3). Ground limestone and salt cake—Carloads, minimum weight 40,000 lb.

†Rate applies in cents per G. T. on crude dolomite.

(a) Applies on crude dolomite, glass sand and ground limestone. (b) Applies on salt cake.

*Proposed rate to expire December 31, 1932.

31513. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass grinding or polishing, loam, molding or silica) and **gravel,** in open top equipment, in carloads, from Cleveland, O., to Farrell, Sharon, Sharpsville, West Middlesex and Wheatland, Penn., 100c per net ton, to McKeesport, Penn., 130c per net ton. Present rates—To Farrell, Sharon, Sharpsville, West Middlesex and Wheatland, Penn., 115c per net ton, to McKeesport, Penn., 160c per net ton.

31517. To establish on **crushed stone,** carloads, when shipped in bulk, in open top cars, from Lima, O., to Dayton, O., 70c per net ton. Present, 14c cwt. (6th class).

31523. To establish on **sand** only, except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica, in open top cars, carloads, from Wolcottville and Winona Lake, Ind., to Van Wert, O., 70c per net ton. Present rate, 75c. Route—P. R. R. direct.

31535. To establish on **sand and gravel,** carloads, from Erie, Penn., to Pittsburgh, Penn., 160c per net ton. Present, 120c.

Sup. 1 to W. D. A. 31432 (withdrawal notice). White Docket Advice No. 31432, Docket Bulletin No. 2161, dated May 6, 1932, covering proposal to establish rate of 60c on **sand and gravel,** carloads, in open top cars, from Massilon, O., to Apple Creek, O., is hereby withdrawn from the docket.

31561. To establish on **crushed stone** and **crushed stone screenings,** in carloads, from Marblehead, O., to South Bend, Ind., 145c per net ton, subject to emergency charge. Present rate, 425c.

31568. To establish on **sand and gravel,** carloads, from Navarre, O., to Wooster, O., 70c per net ton, emergency charge to be in addition. Present, 80c. Route: Via W. & L. E. Ry., Orrville, O., P. R. R.

31541. To establish on **sand and gravel,** carloads, in open top cars, from Massillon, O., to Wick, O., $1.05 per net ton. Present rate, $1.20. Route: B. & O. R. R., Youngstown, O., N. Y. C. R. R.

31614. To establish on **sand** (except blast, core, engine, filter, fire or furnace foundry, glass, grinding or polishing, loam, molding or silica) and **gravel,** from Toledo, O., to Cheboygan, Mich., 210c per net ton, subject to emergency tariff. Present rate, 520c (sixth class).

WESTERN TRUNK LINE DOCKET

7922-A. **Sand and sand pit strippings,** carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from St. Paul, Minneapolis and Minnesota Transfer, Minn., to Milwaukee, Wis. Rates—Present, 9½c per 100 lb.; proposed, 8½c per 100 lb. (Emergency charge is added to the present rate and should also be applied in connection with the proposed rate.)

5701-A. **Sand and gravel** (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Winona, Minn., to stations in Wisconsin. Rates—The following is representative of the situation:

Miles	Pres.	Prop.	Miles	Pres.	Prop.
5	75	46	15	75	52
10	75	50	20	75	56

ILLINOIS FREIGHT ASSOCIATION DOCKET

6637. **Stone, crushed,** in bulk, rough (not dimension or dressed), **rubble, rip rap, quarry strippings and limestone, unburned, agricultural** (in bulk, in open top cars only), minimum weight 120,000 lb., from Lehigh, Ill., to Kankakee, Ill. Rates per net ton. Present, 38c; proposed, 25c.

Proposed I. C. C. Decisions

24338. Gravel. Southern Traffic Service vs. A. C. L. et al. By Examiner John Davey. Dismissal proposed. Rates, gravel, Garysburg, N. C., to Adams Grove, Capron, Lawrenceville, Nurney and South Hill, Va., applicable.

24568. Sand and Gravel. Missouri Gravel Co. vs. C. B. & Q. By Examiner Burton Fuller. Rates, sand and gravel, LaGrange and Reading, Mo., to destinations on the Burlington in Illinois, unreasonable to the extent they exceeded or may exceed rates to key points shown in an appendix. Among the key rates proposed from LaGrange are: 76c a net ton to Mendon; 101c to Monmouth, 113c to Brighton; 126c to Lowder, and 139c to Shattuc. Among the key point rates prescribed from Reading are: 80c to Marble Head; 101c to Silver Lake; 113c to Galesburg; 126c to Concord, and 139c to Hookdale.

Consider Freight Rates in Nebraska

MEMBERS of the Nebraska state railway commission, through their rate and legal representatives, defended before an interstate commerce commission examiner at a recent hearing, their refusal to follow the federal body in giving the railroads operating in Nebraska the same basic rates on sand, gravel, crushed stone and brick as were given in the Federal order.

Evidence was adduced to show that at the time the railroads were before the interstate commerce commission asking for a 15% blanket rate increase they were also before the state commission asking and being given permission to reduce rates on sand, gravel and crushed stone.

J. A. Little, for the Nebraska Brickmakers Association, introduced exhibits showing traffic density in the state and also that there was no discrimination as a result of the state approved rates.

The examiner said there would be no preliminary report, and that the case would be resumed at Washington May 24, with briefs due a month later.—*Lincoln* (Neb.) *State Journal.*

Orders Freight Refund on Gypsum Shipments

THE PENNSYLVANIA Railroad has been ordered by the Interstate Commerce Commission to refund 70c per ton on shipments of gypsum rock from New Brighton to York, Penn., made the last few years.

Upon complaint of the Medusa Portland Cement Co. charges on the basis of $2.80 per ton were found by the commission to be unreasonable, and a new schedule of $1.80 per ton has been ordered.

The direct route between New Brighton and York is 171 mi. The rate of $2.80 per ton was based on an indirect route of 250 mi.

Normally the gypsum company ships 100 tons per week to Medusa.—*Staten Island* (N. Y.) *Advance.*

Foreign Abstracts and Patent Review

Relations Between Cement Analyses and Strengths. H. Luftschitz states that for ten years he has been concerned with the finding of relationships between the chemical composition of cement and its strength. He uses a system of coordinates in which the proportional numbers of tensile strength to compressive strength of 1:7 to 1:18 are entered as abscissa and the absolute tensile and compressive strengths (after 28 days combined storage) are entered as ordinates. He uses a special scale for the ordinates in which 12 kg. per sq. cm. tensile strength is represented by 12 cm. and 120 kg. per sq. cm. compressive strength is represented also by 12 cm., giving a scale relation of 1 to 10.

The wave-like shape of the curves which resulted from the combination of the lines of tensile strength and the lines of compressive strength is striking. The placing of the cements side by side and above each other leads to the intersecting point of the "bundles" of lines where the proportion of tensile to compressive strength is exactly 1:10. At each vertical conjunction of the tensile and compressive strength of a cement, the accessory lime content found by analysis is entered above, and below is entered the silicic acid content found also by analysis. In this manner it is recognized that ordinary portland cement with normal strength values consists of four subgroups of diverse kinds, which differ in lime and silicic acid content. These differences are of course small, but nevertheless (and in this lies the peculiarity) they are of importance for the rising or falling of the wave lines, or the peaks and valleys of the "bundles."

The lime content of the "bundles" or waves joining at the point of intersection (1:10) increases upward, but the silicic acid content increases downward. If the proportion 1:10 of tensile strength to compressive strength is observed closer, and selected as a starting point for further observances, the lime figures increase from 62.2 over 62.9 to 63.3 and 64. The silicic acid content in contrast to the lime content, increases downward from 20 over 21.4 and 22.1 to 23.4. The curves would probably be more complete if more analyses and figures of strength had been available.

If the curves are cross-hatched, it is clearly recognized that the ideal cement with high tensile and high compressive strength is to be found in the upper curves. In the ideal cement would have a lime content of 63.0 to 63.9 in the medium-limed cement, and 65.4 to 66.1 in the high-limed cement, with silicic acid figures of 21 to 22% in the medium-limed cement and 19 to 20% in the high-limed cement. — *Tonindustrie-Zeitung* (1931) **55**, 92, pp. 1276-1278.

Classification of Hydraulic Binders. R. Feret presented as a contribution towards standardization a paper before the French Association for Testing Materials (L'Afnor) relating to the nomenclature, definitions and limits of strength of hydraulic binders. He dealt with the definition of the diverse kinds of hydraulic binders according to their manner of manufacture and their general properties, and with the subdivision of each class of product into many qualities according to their amount of strength. The accompanying table of classification of hydraulic binders appears in this paper:

—*Revue des Materiaux de Construction et de Travaux Publics* (1931) 263, pp. 311-317.

CLASSIFICATION OF HYDRAULIC BINDERS

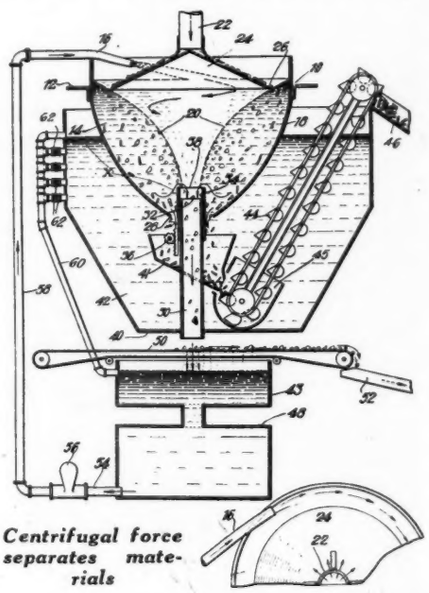
Hydraulic binder		Minimum strength after: 2 days	7 days	28 days
Natural binders				
limes: hydraulic			5	12.5
eminently hydraulic	normal		12.5	25
	special		25	50
grappier cements and slow or semi-slow natural cements	ordinary		12.5	25
	normal		25	50
	special		50	100
Roman cements	ordinary	12.5	20	32
	normal	20	32	50
	special	32	50	80
Artificial binders				
artificial cements, properly called	ordinary		50	100
	normal		100	160
	special		160	250
artificial cements, high initial strength	normal	100	250	320
	special	160	320	400
aluminous cements	normal	250	320	400
	special	320	400	500
Metallurgical binders				
[1] laitier (slag) limes	ordinary		12.5	25
	normal		25	50
	special		50	100
[2] iron cements and [3] blast furnace cements	ordinary		50	100
	normal		100	160
	special		160	250
[4] cements of laitier (slag)	ordinary		25	50
	normal		50	100
	special		100	160
[5] permetallurgical cements	normal		100	160
		100	250	320
Other compounded binders				
mixed cements and thinned cements	ordinary		12.5	25
	normal		25	50
	special		50	100
cements from gaize	normal		80	160

[1] Very little slag; [2] 30% slag, 70% artificial cement; [3] 30-85% slag and 70-15% artificial cement; [4] 70% slag and 30% artificial cement; [5] 85% slag, very little artificial cement.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Process of Hydraulic Separation. This method uses a combination of centrifugal force and hydraulics. The feed comes in through a pipe (22) and spreads on a cone. Here it meets a jet set tangentially to the edge of the cone. This sweeps off the feed and gives the water in the vessel below a whirling motion. The vessel is of parabolic shape and the under side of the whirling body of water takes the shape of the vessel while the upper surface that as shown by the dotted lines. The heavy materials go to the wall of the vessel and drop into a pocket which feeds into an elevator. The light particles stay away from the vessel and go down into the pipe (30). They fall on to a perforated conveyor belt. The water from this belt is filtered and then goes to a pump which feeds the jet. To maintain sufficient water for the jet some water is taken out from the upper part of the large



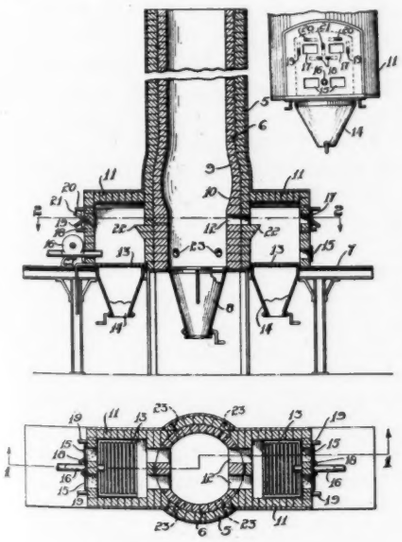
Centrifugal force separates materials

outer vessel in which the vessel with the whirling current is suspended. The device is especially intended to separate coal and slate, but it might have applications in the rock products field, such as separating sand and gravel from trash and lignite.—*Frank Pardee, assignor to Anthracite Separation Co., Hazleton, Penn., U. S. Patent No.* 1,825,157.

Coating Damp Stone with Bituminous Materials. In a previous patent the inventor covered the use of sulphonated oils and compounds of oleic acid to coat damp stone and avoid the expense of drying the stone. But there are reasons why an inorganic substance is preferable and in this patent he covers the use of a colloidal clay such as bentonite.

In practice the bentonite is 5 to 8% of the weight of the water with the stone (averaging about 0.15% of the weight of the stone). The damp stone (wetted if necessary) is thoroughly mixed with the bentonite in a pug mill or similar device to coat its surfaces. Then it is treated with a liquefier, such as kerosene or naphtha, and then with the hot asphalt. Owing to the chilling effect of the wet stone the asphalt should be heated to about 300 F. The amount of asphalt used is substantially the same as for coating dry stone, varying with the fineness of the stone to be coated from 80 to 130 lb. Asphalt of 100 penetration is preferred, but for warm climates this may be lessened.—*Samuel Sadtler, assignor to Amiesite Asphalt Co. of America, Philadelphia, U. S. Patent No.* 1,824,931.

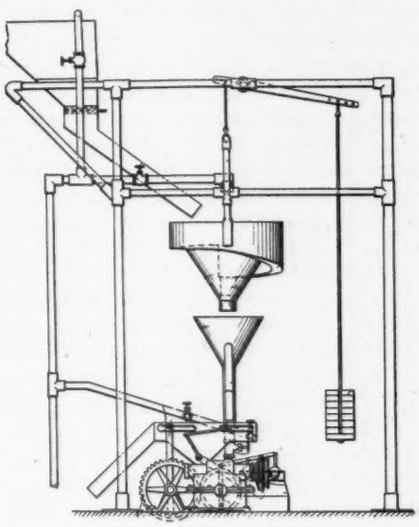
Lime Kiln. The furnace of this lime kiln is so designed that soft coal may be used as fuel, and that the combustion will be practically complete before the hot gases enter the kiln shaft. With other kilns of this kind the inventor says that it is necessary to allow the fire to die down before poking down the lime through the fire eyes. In this kiln he has placed a door (17) over the opening opposite the fire eye. Pipes (18, 19, 20 and 21) are placed in the wall around this door in such a way that a draft is directed away from this door when it is open, the draft being toward the fire eyes. The shelf, 22, under the fire eyes, which directs the fresh gases away from the fire eyes, is also covered by the patent.—*Embra T. Reed, U. S. Patent No.* 1,805,151.



Improves the fire eyes

Method of Sand Treatment. The sand and water fall into a cone which is suspended and counter balanced by weights. Within this cone is a conical valve carried on a pipe which is stationary. When sand accumulates in the cone its weight pulls the cone away from the valve, allowing the settled sand to run out.

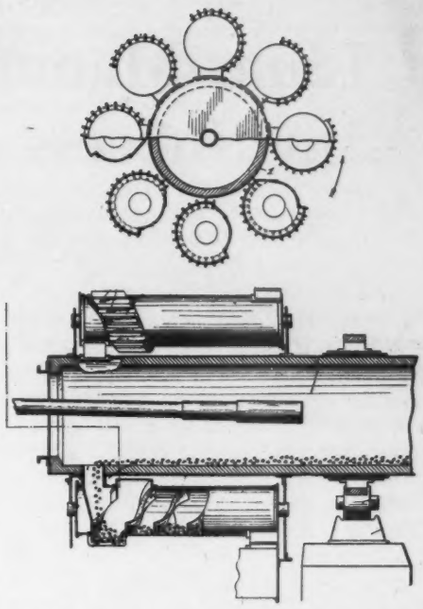
The pipe which carries the valve is perforated and connected with a water supply so that the sand in the cone is washed and any masses or lumps are broken up. After passing this cone the sand goes to a cone below. This has a screen in it on which the sand falls. Part of the water in the sand is drawn off into the space below the screen,



Uses air to clean screen

as this is connected to a suction pump. To prevent the sealing of the screen perforated pipes are placed beneath it, connected to air pressure. The screen may be blown free continuously or occasionally. After being partially dewatered on this screen the sand flows through a pipe to a trough below. In this trough is a reciprocating conveyor that drags out the dry sand. The bottom of the trough is a screen and the water is drawn from below it by a suction pump as in the first dewaterer, and there is the same arrangement of compressed air pipes for blowing the screen clear.—*O. W. Hosking, U. S. Patent No.* 1,824,350.

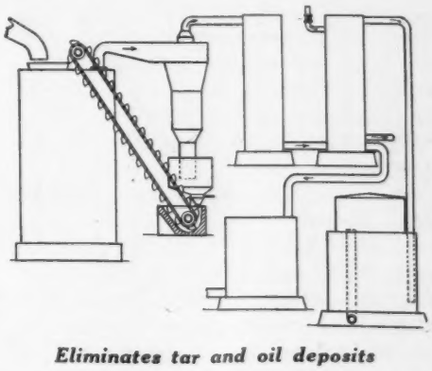
Rotary Kiln and Cooler. This patent is for an improvement on a well-known form of cement kiln and cooler in which the clinker is cooled in a number of tubes surrounding the body of the kiln. The improvement consists of a spiral enlargement on each cooler tube which receives the clinker



Spiral enlargement added to cooler tube

as it is discharged from the kiln. By the continued revolution of the drum the spiral conveys the clinker onward into the drum where it is taken up by the conveyor flight before in use. Some advantages noted are that the clinker is prevented from falling back into the kiln; there is a greater opportunity for radiation, and hence better cooling; and the arrangement is less liable to damage.—*P. T. Linhard, Assignor to F. L. Smidth and Co., New York. U. S. Patent No.* 1,813,061.

Collecting Dust from Producer Gas. In ordinary collectors for this purpose the dust is collected with oil and tar, forming a solid cake that cannot be readily removed. The dust cannot easily be burned again on this account. In this invention the collector, of the tall and slender cyclone type, is designed that the gas passes through it at a speed sufficient to collect the dust without giving time for the gas to cool sufficiently to precipitate tar and oil. The dry dust is then returned to the producer by the elevator shown. Tar and oil are taken out in the collecting tanks farther on.—*Ora B. Cahoon and Edward L. Hogan, assignors to American Blower Corp., Detroit, U. S. Patent No.* 1,823,587.



Eliminates tar and oil deposits

Lime Manufacturers Much Encouraged by Success of Lime Mortar Promotion

National Lime Association's Annual Meeting at Cleveland Marked by Genuine Optimism

AT the 14th annual convention of the National Lime Association in Cleveland, Ohio, May 24 and 25, some of the younger generation in the lime industry had their first real inning, and it was entirely clear that whatever doubts the older members may have as to the future of the lime industry, those who are on the firing line at the present time are full of confidence.

One entire afternoon session was devoted to a symposium on merchandising, with **A. B. Mack,** vice-president, Kelley Island Lime and Transport Co., Cleveland, in the chair.

Creative Selling

Donal O'Connor, general sales manager, Rockland and Rockport Lime Corp., New York City, discussing his subject, "Is the Lime Industry Suffering from Over-production?" started out by stating that the expression "over-production" is over-done and that what was needed to meet the present situation was a little sound thinking, which could much better be over-done than under-done.

He said that there was plenty of modernization work in sight. He did not believe that the prices of lime or any other commodity could be arbitrarily raised, and pointed to the copper industry and others to prove the failure of all stabilization plans to date. He blamed the present status of the lime industry more on the little effort made to maintain its place than to economic conditions generally. He said no really serious attempt had been made in a number of years to sell lime.

Mr. O'Connor, however, thinks that at last the lime industry is beginning to fight and that if the fight were maintained, lime consumption in the construction field would be increased tenfold, and his estimate was not a guess but based on actual experience in the increase of lime mortar due to the strenuous promotional campaign of the industry during the last year or two.

He mentioned particularly the enormous number of leaky buildings in Boston, New York and other metropolitan cities where largely other than lime mortar had been used in the last few years and was positive from the experience in Boston that a 2 lime: 1 cement: 9 sand mortar was a specific cure for leaky masonry walls.

Mr. O'Connor reviewed the recent history of lime mortar promotion in Boston where last summer, under the auspices of the National Lime Association, a meeting of architects, contractors and engineers was called and was addressed by Norman G. Hough, president of the National Lime Association. Of the 195 architects who attended this meeting, only two showed no interest. The others showed very considerable interest in that they very shortly afterwards appointed a committee of their own to study the subject of leaky masonry walls and report back to their local organization. This committee discovered what the lime manufacturers have known for years—that cheap, speculative apartment houses, where a straight lime mortar had been used, in nearly every instance had dry walls, whereas high-class buildings, constructed with all the skill available but using more modern masonry mortar materials, were almost invariably leaky.

The committee of the Boston Chapter of the American Institute of Architects which studied the subject reported last December and recommended practically a 1 lime putty:'1 cement: 6 sand mortar. The former specifications in Boston, as in nearly all other cities, called for a portland cement mortar with 10% of hydrated lime.

Following the meeting in Boston, a similar meeting was held in Albany, N. Y., which resulted in changing the New York State specifications of the Department of Public Works so that a 50% mixture of lime putty and portland cement is now recognized. By similar methods the state of New Jersey specifications and the building code of the city of New York now recognize lime plaster.

Failure to accomplish these results many years ago, Mr. O'Connor contended, was due to the failure of lime manufacturers to do a constructive and creative selling job. They had been too much interested in taking business away from each other to really sell lime.

He said that the trouble with lime is usually in the mixing box and not at the kilns, and that ordinarily with the lime on the job, one manufacturer's product is as good as another's. He confidently believed that a good share of the plaster business could be won back and that if the lime business could obtain 30% of the plaster business, it would mean prosperity to the industry. He predicted the biggest development ever in the lime industry when construction work is again anything like normal. He emphasized the fact that every salesman should know lime and urged both salesmen and lime manufacturers to get out and call on architects, both for their own education and the architects'. He pointed out and illustrated numerous very inconsistent specifications for lime, which showed that the architect's knowledge of lime is very limited. He believed that the lime industry should do a good job of national advertising and should, so far as possible, standardize its product. He mentioned the fact that lime is practically never sold under a brand name and practically in no kind of standard container.

Know Your Product Thoroughly

Thomas L. Read, special representative, Kelley Island Lime and Transport Co., Cleveland, Ohio, discussed "Successful Selling Based on Facts and Confidence." He said that the problem was one of under-sales rather than one of over-production, that one must make the right start backed by a real knowledge of his product, that economic conditions had changed selling methods in the lime industry as well as some others and that personal acquaintance and friendships with dealers no longer was important or an asset to the lime industry, that positive selling to the contractor or architect direct was what really counted. He also thought that lime manufacturers lacked confidence in their own product, having been misled by advertising and promotional propaganda of their competitors. The prime requisite in selling lime, he said, was to know the facts regarding lime which many lime manufacturers did not know. Lime nor any other product, he said, could be sold on its past history. It is how it meets present-day construction problems that counts. The manufacturers of competitive materials have given the consumers a much better understanding of their materials than lime manufacturers have done for theirs.

Mr. Read cited numerous instances of specific jobs that had been sold for lime mortar to show how it had been and

could be done. He thought the lime industry should not stop with a 1:1:6 lime mortar such as accepted in Boston but should go out strongly for a 2:1:9 mortar or even a 3:1:12 mortar mixture, and that research work to find out the facts in regard to mortars should be done.

Possibilities in the plaster field, Mr. Read thought, were just as good as had been proved in the mortar field, and he described the changes that had taken place in plaster practice in the last twenty years and how they had worked against lime plaster. But he believed that lime plaster could be adapted to meet these changed conditions and, consequently, much could be done to restore lime for base coat plaster work.

Good Ethics Are Good Business

George I. Purnell, general sales manager, American Lime and Stone Co., Bellefonte, Penn., speaking on the subject, "Type of Salesmanship Most Effective," carried out the thought expressed by the preceding speaker, Mr. Read, that dealers could no longer be depended upon to sell lime, that the dealer's training came almost entirely from contacts with salesmen of the various material manufacturers, and that it was the salesmen of the material manufacturer who must do the development work which led to the order placed with the building supply dealer. He must do the development work whether or not his own firm finally got the order. This kind of sales work, he emphasized, is not the "cut price" kind but constructive selling. Consequently, it was not good practice for a lime manufacturer to pick up salesmen who were released by another lime manufacturer purposely to get rid of that particular type of salesmanship.

The lime manufacturer, Mr. Purnell said, should carefully instruct his salesmen in the policy of the industry and in the policy of his own company, because the industry and the company both depended on their salesmen to establish the prestige of the industry and of the manufacturer. He said salesmen should not be put on a pedestal to be shot at by all the organization for not bringing in orders immediately, for to do that led to spectacular stunts, but they should be encouraged to do a really constructive job of selling instinctively. Each call should be reported on. A salesman's request to his home office should be promptly taken care of and he should undergo a regular course of development. The use of jobbers in the lime industry was bad practice. Unethical acts of salesmen should not be countenanced. He said salesmen are often accused of bad ethics when it was really the executives who were at fault.

Salesmen, Mr. Purnell said, should be able to discuss lime intelligently with users. He believed that advertising was a great builder of prestige, but advertising needs personal follow-up. He was convinced from his own experience that 2 lime: 1 cement: 9 sand was the best mortar mixture to meet competition. He described at considerable length the kind of competition that was being met. Selling the dealer was the last and least important part of a lime salesman's job. Too often he went to the dealer first, only to find that his call was too late.

Mr. Purnell said his own company had used the type of development work described and got results commensurate with those of competitive commodity manufacturers who had been using such methods for a long time. He quoted the case of a contractor as typical, whose only knowledge of lime had come to him through the salesmen of competitive materials. Mr. Purnell did not believe that research work was needed so much as the use of data already available. He said the same line of selling and promotion held true in regard to agricultural lime and deplored the lack of interest of the lime manufacturers themselves in their own product. He said that the regional meetings, such as those described by Mr. O'Connor in Boston and elsewhere, were seldom attended by lime manufacturers themselves, within his experience.

Get Acquainted With Architects!

J. M. Deely, vice-president, Lee Lime Corp., Lee, Mass., speaking on the "Effect of Sales Promotional Meetings," described in considerable detail the New England group meetings of the lime industry conducted by the president of the National Association, Norman G. Hough, and the very pleasing results that have followed. Architects, contractors, building inspectors, etc., were invited to attend these meetings, which in practically every instance resulted in changing of specifications and recognition of lime mortar.

Mr. Deely stated that relatively little promotional work was wasted on building material dealers, but calls were made on architects, contractors and engineers—a type of work that a real salesman likes because it is educational and brings him in contact with a very fine clientele. As Mr. Deely emphasized, creative salesmanship is always pleasing to the salesman. He believed under the circumstances and with the background and progress of lime mortar, it would be relatively easy to promote lime plaster by the same methods. He specially counseled against discussion of the relative merits of high calcium and magnesium limes and said that one of the results of constructive salesmanship done by the New England group was much better competitive relations among the lime manufacturers, even though there was not business enough to go around. He was very much in favor of continuing the promotional regional meetings of the National Lime Association and very much opposed to any curtailment of its present activities.

Norman G. Hough, president of the National Lime Association, summarizing the four papers above, emphasized the great opportunity for sound, constructive, profitable marketing of lime, since it had clearly been demonstrated how it is being done already. President Hough stated that it was his belief that we are not so very far removed from a period of prosperity in which the ability of an industry to merchandise intelligently its product would be all important in measuring the prosperity of that particular industry.

President Hough mentioned several specific instances in which the National Lime Association had been able to obtain recognition for lime mortar from one or another of the various departments or bureaus of the national government which were engaged in building construction.

George B. Wood, president, Rockland and Rockport Lime Corp., Rockland, Me., emphasized the psychology of creative selling, the fun and satisfaction and pride that comes to a salesman in doing a really constructive job, part of which the executives themselves should get if they are in whole-hearted sympathy with the trend.

President's Address

The principal feature of the opening session was the annual message or report of **Norman G. Hough,** president of the Association, in which he laid emphasis on the economic changes taking place in business and industry and the part played by the trade association in meeting these conditions and in the inevitable readjustment to follow. He emphasized that distribution and merchandising were the all important problems of the lime industry at present, and to solve these problems research, promotion and advertising were essential.

A review of present competitive conditions shows that much more lime is being used in mortar than ever before, according to Mr. Hough, although the stagnation in the building industry does not make this as apparent as it would be under normal conditions. He said that he had proposed a five-year program for the lime industry with specific plans for promotion in each district of the industry, but that with fundamental business conditions as they are at present, he did not consider the proposal of a five-year plan at this time feasible, and preferred to look ahead only a year.

Future of Construction

Col. Willard T. Chevalier, publishing director, *Engineering News-Record,* discussing the subject, "Wither Are We Bound?" gave an address along the lines of that given before the National Sand and

Gravel Association's annual meeting at Pittsburgh in January, and reported in ROCK PRODUCTS, January 30. He defined the place of the construction industry in the economic scheme of things as "the activity of fixing our surplus earnings in those fixed structures which are required for the conduct of industry, commerce and community life."

Col. Chevalier stated that too many of our statesmen and other publicists were governed by copybook maxims, extolling the virtues of thrift and economy, forgetting that thrift no longer necessarily means frugality but intelligent spending. He quoted from an article in a recent issue of the *Atlantic Monthly* by the British economist, Keynes, a very pertinent paragraph which follows:

Practically all the remedies popularly advocated today are of this internecine character. Competitive wage reductions, competitive tariffs, competitive liquidation of foreign assets, competitive currency deflations, competitive economy campaigns —all are of this beggar-my-neighbor description. For one man's expenditure is another man's income. Thus, whenever we refrain from expenditure, while we undoubtedly increase our own margin, we diminish that of someone else, and if the practice is universally followed everyone will be worse off. An individual (and this applies to a corporation) may be forced by his private circumstances to curtail his normal expenditure, and no one can blame him. But let no one suppose that he is performing a public duty in behaving in such a way. The modern capitalist is a fair-weather sailor. As soon as a storm rises, he abandons the duties of navigation and even sinks the boats which might carry him to safety by his haste to push his neighbor off and himself in.

Col. Chevalier did not believe that government control of competition in industry, particularly in so far as it would control investment in the productive capacity of an industry, would ever be practicably worked out. At the same time, however, he believed that our present national financial system had been originally designed for an agricultural country to promote manufacturing industries—that we had not recognized the tremendous changes that have taken place in this country in the last 150 years, that it was largely due to the continuation of this policy that we had developed such enormous productive capacity without, at the same time, having increased the consumptive capacity to keep pace.

The most interesting and pertinent part of Col. Chevalier's talk was his answer to President Hoover's letter to the president of the American Society of Civil Engineers, made public in the newspapers on the morning preceding the address. His point was "How is private industry going to help its way out if public investment cannot? If investment in community facilities is an evil thing, as we are told it is, doesn't that make the situation much worse?" He said that until somebody somewhere started spending, there certainly was no incentive for private industry to spend on production facilities.

Col. Chevalier took up the President's letter paragraph by paragraph and showed how inconsistent these were with the actual proposals made by the committee of the American Society of Civil Engineers, of which he was a member. He also described the President's letter as evasive and insincere.

Col. Chevalier concluded by stating that before we reestablish the capitalistic system in this country on a sound basis, there must be many revisions in our present scheme of things. There must be a balance between production and consumption and a better use of surplus, and taxation will have to be revised to absorb excess earnings. He confidently believed that the construction industry would be developed to serve as a balance wheel in the new economy.

Salesmanship

Stanley Newman, treasurer, Stanley Newman Co., Boston, Mass., waterproofing engineers, spoke in a general way on salesmanship, emphasizing chiefly the virtues of a knowledge of human character and strength of the formula, "Honesty Is the Best Policy," illustrated largely with instances from his own experience.

Lime and Sanitation

W. V. Brumbaugh, assistant secretary, National Lime Association, delivered a short paper, "Potential Lime Tonnage in the Field of Sanitation," in which he briefly described recent developments in sewage treatment with particular reference to the new Dearborn, Mich., plant which is attracting nation-wide attention. This plant is housed in a relatively small, compact building and was erected for 50% of the estimated cost of the originally proposed activated sludge plant. It uses the chemical precipitation process with lime and ferric chloride, the sludge being dewatered with Oliver-United filters. The process uses approximately 800 lb. of lime per 1,000,000 gal. of sewage treated. Another new process of chemical precipitation of sewage also requires lime, in fact, lime seems to be essential in all chemical treatments of sewage, due to the necessity or desirability of keeping the pH or acidity value of the sewage approximately neutral.

Because of the cheapness and compactness of these new types of plants, there is every reason to believe that they will largely supplant the older types of sewage treatment.

To give some idea of the potential tonnage involved, Mr. Brumbaugh stated that the larger cities would use from 25 to 72 tons of lime per day. The proposed Chicago west side sewage plant would require 170 tons of lime per day. The tonnage of lime required would be cut down somewhat by the partial recovery of lime through the burning of the sludge.

Agricultural Lime

H. J. Wheeler, former agronomist of the American Agricultural Chemical Corp., and prior to that, in charge of the Rhode Island Agricultural Experiment Station, discussed the use of lime in agriculture, emphasizing particularly that it was very important to use the correct amount of lime, as many crops were hurt by too much lime as well as by too little. Most crops do best with a soil near neutral or having a pH value of around 7. He emphasized the possibilities of using increasing amounts of lime in fruit culture, showing how the treatment of trees with insecticides containing sulphur resulted eventually in too acid a soil for best results.

In the promotion of agricultural lime Dr. Wheeler seemed to think that demonstration trains, etc., often do little good unless they are properly supervised. He discounted dealer distribution as unsatisfactory and suggested that the dealer be used merely for warehouse purposes. He thought the only satisfactory way to promote the use of lime in agriculture was through well qualified salesmen who would personally demonstrate to farmers, preferably on a strip of land adjoining the highway, just what lime would do with the particular crop he was interested in. He stated that the exact determination of the correct amount of lime required was necessary so that the lime would not be actually harmful.

Accident Prevention

Thomas J. Quigley, inspector, Mines and Quarries, Pennsylvania Department of Labor and Industry, Harrisburg, Penn., reviewed the accident record of the quarry industry in Pennsylvania, mentioning particularly the remarkable accident prevention record made by the J. E. Baker Co., York, Penn., crushed stone and lime producers. This company was recently awarded the prize of the Pennsylvania Manufacturers' Association for the best five-year record in accident prevention. It had previously been awarded the Holmes certificate of the United States Bureau of Mines. Mr. Quigley urged the revision of insurance rates based on the size of operation and record of the operating company rather than blanket rates which included careless operations and also little operations as well as large ones.

Future Business

Dr. David Friday, economist, Washington, D. C., made the principal address at the annual banquet of the Association. His address can be summarized in very few words—"Balance the Budget" if we are ever to have peace and prosperity in

this country again. His theme was that people who have money now would not loan it even to the United States Government until the Government has demonstrated it can balance its budget.

Problems of the Lime Industry

Charles Warner, president of the Warner Co., Philadelphia, Penn., in a very inspiring address, reviewed previous developments of the National Lime Association and gave as his opinion that it was now better organized and had a clearer view of its duties and functions than ever before in its history. He expressed the opinion that it was practically impossible to standardize lime and that consequently research was not of any very great use to the lime industry except possibly in some lines of purely scientific research. He said the lime industry was a local industry governed by local conditions, that the policies of the national association must take this into account and leave to the districts themselves the promotion of their own products. He mentioned as an example the promotion of agricultural lime in the East where lime is quite generally used in preference to agricultural limestone. He thought the present staff of the National Lime Association was absolutely the minimum to carry on the work and thought that national advertising was very desirable, even if not feasible at the moment. He was sure that non-members did not appreciate the service rendered by the Association in a routine way.

Mr. Warner emphasized the need of unity in meeting the competition of other industries. He spoke of the practical failure of the Federal trade practice conference of the lime industry because of the fact that no teeth were provided for enforcing the rules of the conference. He hoped and believed that this might be changed by Congress in the future, but the present Congress, however, can be expected to do little but settle the budget and relief legislation.

Mr. Warner believed that there was a growing sense of responsibility in the lime industry and a growing appreciation of the need of cooperation. These were undoubtedly by-products of the present depression, but it did not pay to worry too much about problems of the moment; it is better to plan for the solution of those in the future. There is hardly a section of the country, he said, that has not had radical changes in business, and he thought that consolidations or mergers at present-day values would result in many economies and in cost saving. By getting rid of uneconomical practices more money would be available later for real promotion. All business should be governed by present-day conditions to bring about radical changes in the organization of industry. He thought that the average American should know more about national affairs as, for example, the pending home loan bill in Congress, the passage of which would have a marked effect on the immediate future of the lime industry.

Officers Elected

The organization of the National Lime Association was continued practically as at present. **Bernard L. McNulty,** president, Marblehead Lime Co., Chicago, was reëlected chairman of the board of directors. The other officers also remain as they were. The following list of directors was elected:

District 1: C. C. Loomis, New England Lime Co., Pittsfield, Mass.

District 2: S. W. Stauffer, J. E. Baker Co., York, Penn.

District 3: Ray C. Noll, Whiterock Quarries, Inc., Bellefonte, Penn.

District 4: L. P. Dillon, E. Dillon Sons, Inc., Indian Rock, Va.

District 5: G. J. Whelan, Kelley Island Lime and Transport Co., Cleveland, Ohio.

District 6: G. J. Nicholson, Inland Lime and Stone Co., Manistique, Mich.

District 7: B. L. McNulty, Marblehead Lime Co., Chicago, Ill. Gordon Willis, Hunkins-Willis Lime and Cement Co., St. Louis, Mo.

District 9: Henry LaLiberte, Cutler-Magner Co., Duluth, Minn.

Districts 10 and 11: F. C. Cheney, Cheney Lime and Cement Co., Birmingham, Ala.

District 12: J. F. Pollock, Ash Grove Lime and Portland Cement Co., Kansas City, Mo.

District 13: I. A. Ogden, Dittlinger Lime Co., New Braunfels, Tex.

District 14: John S. McMillin, Roche Harbor Lime and Cement Co., Roche Harbor, Wash.

District 15: R. E. Tremoureux, United States Lime Products Co., San Francisco, Calif.

Give Option on Ohio Lime Plant

FRAZIER REAMS, Toledo, Ohio, receiver of the defunct Bruns Hydrated Lime Co. of Woodville, Ohio, was authorized by Judge A. W. Overmyer recently to enter into a 30-day option for $1000 with Wolfe and Rogers, Toledo attorneys, representing a syndicate of buyers for the sale of the plant for approximately $50,000. Judge Overmyer's decision followed a meeting of bondholders when the offer of the syndicate to buy the plant was made.

Mr. Reams said the sale price will pay the bondholders 25 c. on the dollar and provide funds for labor and court costs, as well as retiring receiver's certificates of $5000.

The plant was placed in receivership two years ago. Two attempts to sell the plant at receiver's public sale failed because of the lack of bidders.—*Toledo* (Ohio) *Blade.*

Adrian Concrete Products Co.

THE ANNOUNCEMENT of the reorganization of the August G. Matthes firm into a larger and more extensively equipped organization to be known as the Adrian Concrete Products Co., Adrian, Mich., was made on May 24. The new company is composed of Floyd Carpenter, C. W. Addington, J. H. Robertson, Miss Carol Addington and Mr. Matthes. Mr. Carpenter is to be the manager of manufacturing and Mr. Addington is to manage the building materials department.

The plant is being moved from North Main street to quarters used by the Addington Asbestos and Roofing Supply Co.

Lime, cement, plaster, tile, cement blocks, brick, septic tanks, burial vaults and ornamental cement furniture will be carried in stock. A work shop 200 ft. by 50 ft. will be used, simplifying manufacturing operations to be carried on both summer and winter.

The office of the new Adrian Concrete Products Co. will also be combined with that of the Addington company.—*Adrian* (Mich.) *Telegram.*

Illinois Mineral Industries Conference

THE FOURTH of a series of district conferences devoted to the mineral wealth of Illinois was held in East St. Louis, Ill., on May 25. The conference was held under the auspices of the East St. Louis Chamber of Commerce with the cooperation of the Illinois Chamber of Commerce and the Illinois State Geological Survey. Two papers on the program were of particular interest to rock products producers, "New Trends in the Construction Industry in the Use of Minerals," by C. C. Whittier, consulting engineer, Robert W. Hunt Co.; and "Our New Mineral Development Program," by M. M. Leighton, chief, Illinois State Geological Survey.

S. L. Avery Heads Credit Expansion Group

SELECTION of Sewell L. Avery, president of the United States Gypsum Co., as chairman of the ways and means committee of the Chicago banking and business group working to aid expansion of credit was announced May 26 by Gov. J. B. McDougal of the Federal Reserve Bank of Chicago.—*Chicago* (Ill.) *Daily News.*

Study of Ohio Clays

A REPORT has been issued presenting a detailed study of the geology, composition and physical properties of the Lawrence clay of Lawrence county by the Geological Survey of Ohio. This study resulted after earlier investigation disclosed the area to have large bodies of plastic clay having not only a wide range of usefulness but also having special properties for a few purposes.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

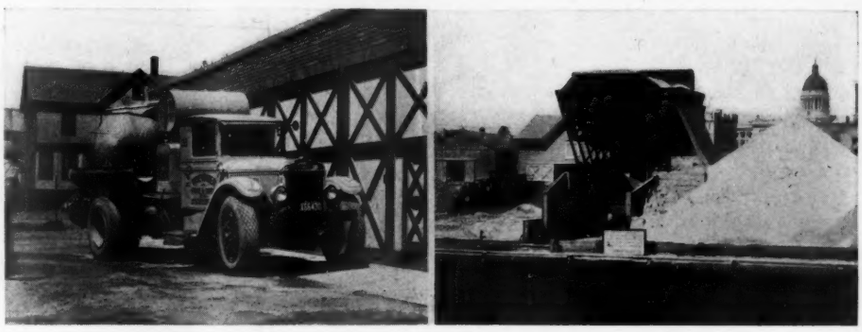
Tidewater Company Has Furnished Batched Concrete Materials for Fifteen Years

THE TIDEWATER Stone and Supply Co., Hackensack, N. J., specializes in concrete and concrete materials. It furnishes ready-mixed concrete, dry batches or the separate ingredients for concrete. Its operation in this field was described in a recent issue of the *Lawrence Dragon*.

For mixing concrete the Tidewater company employs Rex Moto mixers, equipped with positive water control and separate motors for running mixer drums. These trucks are also used as agitators for transporting ready-mixed concrete. When used as agitators, they hold 3½ cu. yd.; as mixers they hold 3 cu. yd.

Not only does the Tidewater company handle concrete and concrete materials, but also a full line of other masonry supplies: brick, tile, plaster, portland cement stuccos, etc., as well as lath and steel sash. Normally, there is a large demand for all of these materials in this concern's territory, which has a radius of about 12 mi. and includes one of the most active sections, from the standpoint of building construction, in the state.

The plant is served by the Hackensack river and the Erie railroad, as well as by concrete roads, radiating in every direction.



One of the mixing trucks at left and batching bin at right

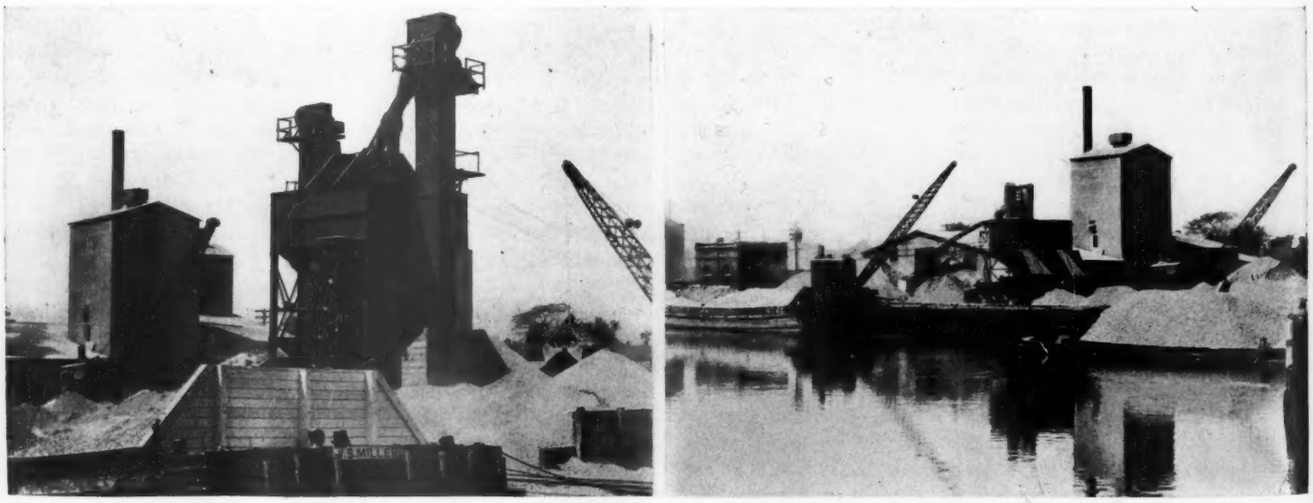
The plant consists essentially of a weighing batcher of 300 tons capacity, used largely for highway work, and equipped with four compartments (three for stone and one for sand); two volume batchers, with two compartments each; and two volume hoppers, of 80 yards capacity each, for separate materials. The weighing batcher is equipped with a bucket elevator. Locomotive cranes operated on standard gage track serve the other batchers.

All sand and stone are delivered to the plant by river, the wharf providing accommodation for five barges at a time. Locomotive cranes also unload these materials. Cement comes in by rail.

There are two Ohio locomotive cranes in service at this plant, each equipped with a 1¼-yd. clamshell bucket. Together they can unload from the barges and load into the several volume hoppers, 750 to 1000 cu. yd. of sand and stone a day. On the outgoing end of the plant, a 3-yd. truck can be loaded in three minutes with a complete charge of cement, sand and stone.

The concern has been in business 15 years.

Batched concrete materials have been supplied the trade ever since the company has



Two views of plant of Tidewater Stone and Supply Co., Hackensack, N. J.

been in business, and transit-mixed concrete for the past 2½ years.

Herman B. Ferber is president of the company, and Franklyn S. Weisgerber, secretary and treasurer. Mr. Weisgerber formerly operated the Chisholm-Weisgerber Co., a contracting concern operating in this same section.

Steam Curing Concrete Products

IN A PAPER printed in the April issue of the *Journal of the American Concrete Institute*, entitled "Notes on Hardening Cements at the Boiling Point of Water," by P. H. Bates and R. L. Blaine, of the United States Bureau of Standards, it is concluded:

"In this brief study of accelerated hardening of mortars made from several cements at the boiling point of water only atmospheric pressures were used. The data show that different cements react quite differently in degree of hardening. If one intended to harden cement products by such methods, it would appear that some preliminary work should first be carried out to determine whether the cement whose use is contemplated would react favorably enough to such methods to justify its use. Between cement B, at average normal cement prices, and C at the price of high early strength portland cement, there could be no doubt as to the saving in the use of the former. Further, it should be noted that the high temperature treatment is only effective for the early ages; even 7 days normal hardening may give better results than high temperature hardening. It should also be borne in mind that the comparisons here made are only on a strength basis. The study did not include observations on the effect of such an equally important factor as volume change, or the economies that may result through ability to market products within three days after making."

In a second paper in the same issue of the *Journal*, entitled "Studies of High Pressure Steam Curing," by J. C. Pearson and E. M. Brickett, of the Lehigh Portland Cement Co., it is concluded:

"The results of this preliminary investigation have in general confirmed the results of previous studies in showing that a remarkable acceleration in the rate of strength and hardening of concrete can be secured by high-pressure steam curing. The results indicate that similar strengths can be developed by curing at a high pressure for a short time, or at a lower pressure for a longer time, but they suggest some advantages in curing at pressures above 100-lb.

"The type and fineness of the cements used have an influence on the strengths attained by high-pressure steam curing, but judging from the limited number included in this investigation, the differences in strength-giving qualities are not as large nor necessarily in the same direction as would be indicated from damp curing at normal temperatures. On the other hand, the 'soundness' of the cements may be an important factor in their behavior when exposed to high-pressure steam.

"The effect of richness of mix and water-cement ratio do not seem to be the same for high-pressure steam cured concrete as for normally cured concrete, unless the concentration of the cement in the voids of the aggregate is low enough to allow the expansion of the cement resulting from the accelerated hydration to develop without setting up disruptive stresses. The tests indicate that the water ratio should not be much lower than 0.6 for concrete to be cured in high-pressure steam, or more generally, that the space-cement ratio should not be less than about 2.25.

"There is nothing in these tests to indicate that consistency is an important factor in concrete to be steam cured, provided the cement has room enough for action as indicated in the foregoing paragraph. The 'cementing efficiency' in dry tamped and lean mixtures seems to be fully as high as in the plastic concretes.

"No extended studies of aggregates have been made, but single samples of high calcium and dolomitic marbles were found to expand appreciably in high-pressure steam, to such an extent that they may prove to be unsuited for concrete to be cured in this manner. This peculiarity may be common to limestones, and possibly to other calcareous aggregates. Our experience with these materials suggests that aggregates, as well as cements, need special tests beyond the requirements of existing specifications, before they can be assumed to be satisfactory for concrete to be cured in high-pressure steam.

"Notwithstanding the extra precautions that may be necessary in producing steam cured concrete, there seems to be excellent possibilities in the process that should be attractive to manufacturers of concrete products. While there is much more to be done in the laboratory on the evaluation of various factors, enough information is available on which to base plant experiments, and these will have to be made in any event, before it can be assumed safely that a given product will be the better for high-pressure steam curing. Some of the possible advantages from this method of curing are:

"1. Higher quality products, in strength, uniformly lighter color, and stability in regard to volume changes, with elimination or minimization of resultant defects such as crazing, cracking, etc.

"2. Completely cured products in 48 hours or less, after making, eliminating necessity for large stocks and storage space, and permitting prompt shipments on special orders.

"3. Control of such properties as porosity, nailability, etc., which are practically impossible of control under the usual processing.

"4. Economy in cement.

"The chief disadvantages are as follows:

"1. Considerable investment in high-pressure equipment.

"2. Somewhat higher cost of curing.

"3. Some restrictions in the use of materials ordinarily considered satisfactory for concrete.

"Some of the factors which need further investigation are the following:

"1. The effect of soundness of cements in relation to the conditions under which they may be used in steam cured products.

"2. Data on the practical limits for space- or water-cement ratios.

"3. The behavior of various types of aggregate in high-pressure steam.

"4. The effect of rate of heating in relation to the size of steam cured specimens.

"5. The effect of period and pressure of steaming, particularly at periods less than 12 hours.

"6. The effect of age before steaming, particularly of ages less than 24 hours.

"7. Determination of the degree of stabilization of volume changes in the cured concrete, particularly with reference to shrinkage and the fluctuations of expansion and contraction with temperature and humidity change.

"8. Assurance that the remarkable acceleration in strength and hardness of high pressure steam cured products has no undesirable after-effects in relation to strength, stability and durability."

Investigation of Concrete Sewer Pipe

AN INVESTIGATION of portland cement concrete sewer pipe in the state of Oklahoma has been carried out and reported in Publication 9 of the Engineering Experiment Station, Oklahoma Agricultural and Mechanical College, Stillwater, Okla. Samples of concrete tile were removed from storm and sanitary sewer systems. Complete records were obtained on the installations represented in the investigation and crushing and absorption tests were conducted. The publication gives detailed information on these tests. The conclusions reached after the investigation were:

Absorption. All samples manufactured by later processes and under later specifications pass the absorption requirements of the A. S. T. M. A few of the older samples did not.

Wet Strength. Concrete sewer tile manufactured in Oklahoma, at present, rates well above the standard strength requirements.

Wall Thickness. There are evidences of too great a variation in wall thickness.

Deterioration. Evidence of deterioration in some of the older service-life sewers is shown by the removal of the finish from the inside of the tile. Few instances of further deterioration were noted.

Failures. Evidence of complete failure of small sized concrete sewers serving domestic areas under fresh sewage conditions is rare.

Service life of small sized concrete sewers, serving domestic areas, is reported as satisfactory by municipal officials, generally, in the state of Oklahoma.

Portland Cement Production, April

THE PORTLAND CEMENT INDUSTRY in April, 1932, produced 5,478,000 bbl., shipped 6,536,000 bbl. from the mills, and had in stock at the end of the month 26,487,000 bbl. Production of portland cement in April, 1932, showed a decrease of 51.3% and shipments a decrease of 41.6% as compared with April, 1931. Portland cement stocks at the mills were 10.9% lower than a year ago.

The statistics here presented are compiled from reports for April, received by the Bureau of Mines from all manufacturing plants except four, for which estimates have been included in lieu of actual returns.

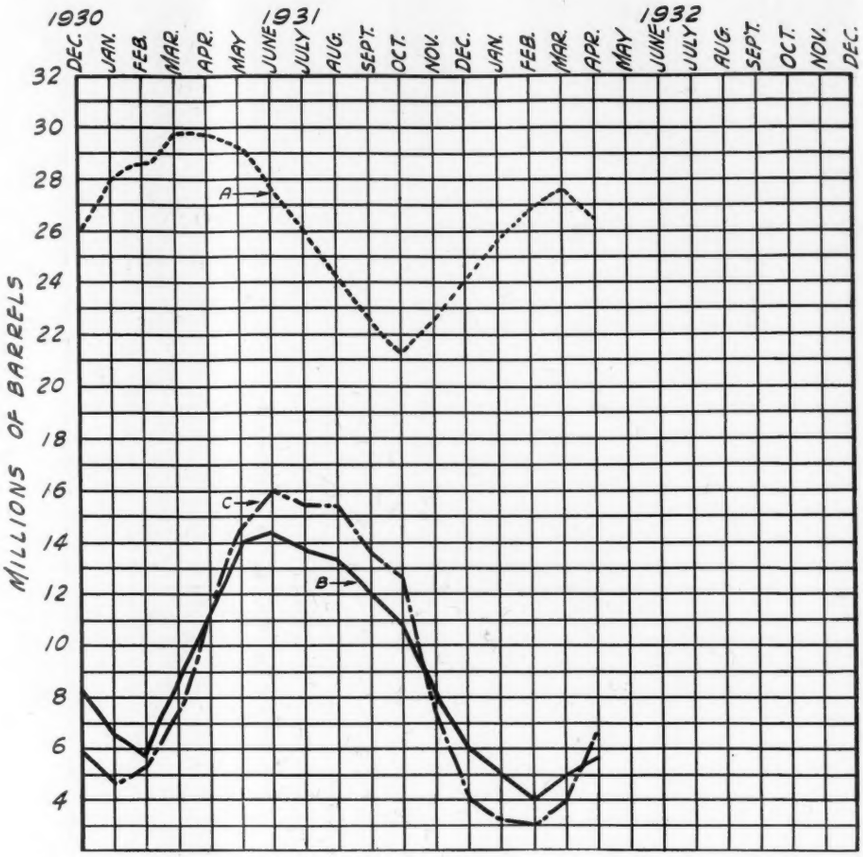
In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of April, 1932, and of April, 1931. The estimates include increased capacity due to extensions and improvements during the period.

RELATION OF PRODUCTION TO CAPACITY

	April 1931 Pct.	April 1932 Pct.	Mar. 1932 Pct.	Feb. 1932 Pct.	Jan. 1932 Pct.
The month	52.1	24.8	21.3	18.7	22.0
12 months ended	57.7	41.7	43.8	45.2	45.9

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during February and March, 1931 and 1932:


1930
1931
1932
DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
MILLIONS OF BARRELS
32 30 28 26 24 22 20 18 16 14 12 10 8 6 4
A
B
C

(A) Stocks of finished portland cement of factories; (B) Production of finished portland concrete; (C) Shipments of finished portland cement from factories

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN FEBRUARY AND MARCH, 1931 AND 1932, IN BARRELS*

Shipped to	1931—February	1932	1931—March	1932
Alabama	103,610	27,589	175,601	35,482
Alaska	159	0	1,111	132
Arizona	36,834	8,383	53,821	20,293
Arkansas	43,685	22,280	74,368	12,353
California	532,384	301,852	691,790	487,421
Colorado	32,603	18,392	42,724	26,601
Connecticut	40,716	24,687	82,833	42,557
Delaware	15,566	12,842	14,473	10,545
District of Columbia	56,388	70,548	76,232	68,265
Florida	60,601	27,805	49,466	31,427
Georgia	81,500	92,049	151,326	99,498
Hawaii	28,265	15,765	24,602	12,565
Idaho	7,472	2,987	16,408	10,944
Illinois	227,023	†108,880	279,580	118,689
Indiana	108,914	† 60,561	130,801	69,500
Iowa	73,262	20,162	121,769	46,383
Kansas	111,835	36,309	133,354	55,666
Kentucky	73,215	47,017	97,970	54,024
Louisiana	156,356	62,045	216,170	72,511
Maine	9,015	4,513	19,556	6,550
Maryland	71,391	57,752	103,592	59,289
Massachusetts	69,184	67,952	151,893	94,976
Michigan	170,815	96,588	200,479	93,462
Minnesota	62,726	26,585	106,842	60,441
Mississippi	31,532	11,977	29,594	27,989
Missouri	182,133	85,579	221,789	115,809
Montana	10,912	3,062	19,072	8,164
Nebraska	49,142	11,655	58,027	35,266
Nevada	6,231	12,238	9,804	24,762
New Hampshire	7,359	4,638	11,868	7,340
New Jersey	151,941	127,933	285,359	135,539
New Mexico	14,839	14,749	23,879	19,237
New York	622,266	469,466	1,035,782	584,409
North Carolina	42,771	36,507	92,639	41,032
North Dakota	5,790	1,395	17,176	4,413
Ohio	219,903	†174,750	308,587	166,664
Oklahoma	125,682	† 90,606	136,628	95,017
Oregon	38,148	26,001	84,549	56,798
Pennsylvania	343,903	†224,349	458,913	227,854
Porto Rico	1,020	1,751	2,672	4,575
Rhode Island	11,454	8,594	25,935	14,861
South Carolina	208,443	30,897	214,460	56,714
South Dakota	21,300	3,503	28,631	11,565
Tennessee	56,391	36,126	91,664	53,689
Texas	309,196	285,206	428,923	384,174
Utah	13,991	6,402	28,086	10,972
Vermont	2,014	4,618	7,389	2,379
Virginia	81,003	57,936	118,992	64,153
Washington	129,223	45,674	174,642	83,502
West Virginia	56,430	47,007	70,953	44,309
Wisconsin	85,088	† 46,973	119,628	64,183
Wyoming	5,333	2,553	8,585	3,579
Unspecified	23,271	0	16,947	8,858
	5,030,228	3,085,688	7,147,934	3,947,380
Foreign countries	43,772	32,312	44,066	25,620
Total shipped from cement plants	5,074,000	3,118,000	7,192,000	3,973,000

*Includes estimated distribution of shipments from three plants in February and March, 1932; from four plants in February and March, 1931. †Revised.

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1931 AND 1932, IN BARRELS

Month	1931—Production	1932	Stocks at end of month 1931	1932
January	8,129,000	6,107,000	10,384,000	8,184,000
February	7,473,000	5,176,000	11,946,000	9,375,000
March	9,586,000	5,443,000	13,318,000	*10,025,000
April	11,540,000	5,924,000	13,854,000	10,501,000
May	13,159,000		13,087,000	
June	12,679,000		11,837,000	
July	12,246,000		10,209,000	
August	11,664,000		8,468,000	
September	10,414 000		6,918,000	
October	9,825,000		6,021,000	
November	8,259,000		6,215,000	
December	6,840,000		7,035,000	

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN APRIL, 1931 AND 1932, AND STOCKS IN MARCH, 1932, IN BARRELS

District	Production 1931—April—1932		Shipments 1931—April—1932		Stocks at end of month 1931	1932	Stocks at end of Mar., 1932*
Eastern Penn., N. J. & Md.	2,691,000	1,497,000	2,587,000	1,720,000	6,725,000	6,014,000	6,237,000
New York and Maine	832,000	537,000	769,000	522,000	2,076,000	1,924,000	1,909,000
Ohio, West'n Penn., W. Va.	829,000	309,000	919,000	520,000	3,476,000	3,190,000	3,401,000
Michigan	524,000	290,000	529,000	259,000	2,586,000	2,045,000	2,015,000
Wis., Ill., Ind. and Ky.	1,231,000	564,000	1,260,000	611,000	4,208,000	3,772,000	3,818,000
Va., Tenn., Ala., Ga., Fla., La.	1,268,000	484,000	1,343,000	537,000	1,639,000	1,548,000	1,601,000
East'n Mo., Ia., Minn., S.D.	1,261,000	420,000	1,029,000	591,000	4,064,000	3,636,000	3,808,000
West'n Mo. Nebraska, Kansas, Oklahoma and Arkansas	674,000	83,000	942,000	505,000	1,885,000	1,483,000	1,905,000
Texas	585,000	397,000	581,000	368,000	777,000	800,000	771,000
Colo., Mont., Utah, Wyo., Ida.	233,000	93,000	184,000	126,000	600,000	398,000	431,000
California	793,000	535,000	733,000	554,000	1,110,000	1,072,000	1,091,000
Oregon and Washington	324,000	269,000	308,000	223,000	569,000	605,000	558,000
	11,245,000	5,478,000	11,184,000	6,536,000	29,715,000	26,487,000	27,545,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1931 AND 1932, IN BARRELS

Month	1931—Production—1932		1931—Shipments—1932		Stocks at end of month 1931	1932
January	6,595,000	5,026,000	4,692,000	3,393,000	27,759,000	25,778,000
February	5,920,000	3,971,000	5,074,000	3,118,000	28,612,000	26,657,000
March	8,245,000	4,847,000	7,192,000	3,973,000	29,676,000	*27,545,000
April	11,245,000	5,478,000	11,184,000	6,536,000	29,715,000	26,487,000
May	14,010,000	.....	14,200,000	.....	29,554,000	.....
June	14,118,000	.....	16,077,000	.....	27,602,000	.....
July	13,899,000	.....	15,545,000	.....	25,934,000	.....
August	13,549,000	.....	15,172,000	.....	24,313,000	.....
September	12,092,000	.....	13,671,000	.....	22,736,000	.....
October	10,762,000	.....	12,360,000	.....	21,218,000	.....
November	8,161,000	.....	7,156,000	.....	22,219,000	.....
December	5,974,000	.....	4,142,000	.....	24,098,000	.....
	124,570,000	.....	126,465,000	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN APRIL, 1931 AND 1932, IN BARRELS

District	1931—Production—1932		Stocks at end of month 1931	1932
Eastern Pennsylvania, New Jersey and Maryland	2,699,000	1,392,000	1,934,000	1,149,000
New York and Maine	979,000	745,000	1,470,000	1,005,000
Ohio, Western Pennsylvania and West Virginia	897,000	243,000	1,710,000	1,062,000
Michigan	486,000	498,000	1,820,000	1,192,000
Wisconsin, Illinois, Indiana and Kentucky	1,419,000	682,000	1,928,000	1,500,000
Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana	1,238,000	466,000	865,000	718,000
Eastern Missouri, Iowa, Minnesota and South Dakota	1,256,000	573,000	1,021,000	610,000
Western Missouri, Nebraska, Kansas, Oklahoma, Arkansas	648,000	107,000	848,000	830,000
Texas	565,000	409,000	288,000	295,000
Colorado, Montana, Utah, Wyoming and Idaho	234,000	77,000	286,000	134,000
California	835,000	554,000	1,294,000	1,720,000
Oregon and Washington	284,000	178,000	390,000	286,000
	11,540,000	5,924,000	13,854,000	10,501,000

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1931 AND 1932

Month	1931—Exports—1932 Barrels	Value	Barrels	Value	1931—Imports‡—1932 Barrels	Value	Barrels	Value
January	41,199	$ 115,678	36,704	$ 82,984	95,609	$ 120,298	14,375	$ 16,648
February	25,703	88,989	12,889	39,350	21,984	25,391	83,706	69,197
March	54,599	144,579	39,105	81,856	70,378	80,360	19,173	17,215
April	40,478	116,564	.....	.....	53,333	58,576	.....	.....
May	48,028	140,953	.....	.....	19,325	20,568	.....	.....
June	43,597	107,610	.....	.....	32,079	42,955	.....	.....
July	29,344	97,837	.....	.....	14,332	15,582	.....	.....
August	39,517	106,643	.....	.....	8,895	11,739	.....	.....
September	27,570	81,399	.....	.....	33,574	33,520	.....	.....
October	24,531	68,524	.....	.....	39,642	42,380	.....	.....
November	33,200	97,796	.....	.....	27,940	22,235	.....	.....
December	21,887	54,028	.....	.....	40,147	34,314	.....	.....
	429,653	$1,220,600	.....	.....	457,238	$ 507,918	.....	.....

Exports and Imports†*

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN MARCH, 1932

Exported to	Barrels	Value
Canada	442	$ 1,327
Central America	23,814	35,070
Cuba	1,077	3,247
Other West Indies	792	1,422
Mexico	3,447	9,319
South America	8,759	27,725
Other countries	774	3,746
	39,105	$81,856

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS IN MARCH, 1932

Imported from	District into which imported	Barrels	Value
Belgium	Porto Rico	2,527	$ 1,709
Cuba	Porto Rico	5,053	$ 7,620
Denmark	Porto Rico	9,265	$ 5,992
	San Francisco	3	3
	Total	9,268	$ 5,995
Japan	Hawaii	2,325	$ 1,891
	Grand total	19,173	$17,215

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO IN MARCH, 1932

	Barrels	Value
Alaska	148	$ 377
Hawaii	19,309	45,186
Porto Rico	4,350	5,949
	23,807	$51,512

*The value of exports of domestic cement is the actual cost at the time of exportation in the ports of the United States whence they are exported, as declared by the shippers on the export declarations.

†The value of imported cement represents the foreign market value at the time of exportation to the United States.

‡Includes hydraulic cement clinker, and white nonstaining portland cement.

Cement Plants Set for June Safety Drive

WITH APPROXIMATELY 100 plants and quarries enrolled in the annual June No-Accident Campaign, W. M. Kinney, general manager of the Portland Cement Association, recently said: "An analysis of previous low accident records established in the past six June No-Accident Campaigns conducted by the Portland Cement Association indicates that it is not only mathematically possible, but quite probable, that all of the plants in the membership can operate without mishap to any employe during the forthcoming month of June. We are looking forward to the establishing of a new all-time low record in June, 1932."

All the plants enrolled have been supplied with a specially designed safety flag which will be raised on the plant flagpole on the morning of June 1. These flags will fly continually until an accident occurs.

During the month of May all plant safety committee meetings and rallies have been devoted to a general preparation for the drive against accidents starting midnight, May 31.

Cement and Lime in Canada

THE Dominion Bureau of Statistics at Ottawa reports that the production of portland cement in Canada during March amounted to 276,172 bbl.; in February, 235,895 bbl. were produced, and in March, 1931, the total was 607,872 bbl.

Exports of portland cement from Canada declined to 379 bbl. Imports of cement during the month totaled 625 bbl., made up of 430 bbl. from the United States and 195 bbl. from Great Britain.

Lime—Shipments of lime during March totaled 29,108 tons as compared with 23,632 tons in February and 29,249 tons in March, 1931. During the first three months of 1932, lime production amounted to 76,425 tons.

Exports of lime during the month were recorded at 1543 tons, valued at $32,388. Lime importations declined to 19 tons at $476.

Cement in 1930

STATISTICS on cement in 1930 have been issued by the Bureau of Mines in booklet form. The most interesting feature of the report is a complete list of cement plants, manufacturers, and brands, by state. This list includes manufacturers of hydraulic, masonry and natural, puzzolan and alumina cements. The list is given as of September 30, 1931.

Repairs Fire Damage at Cement Plant

INCREASED DEMAND for cement and lowered stocks on hand is hastening restoration and repairs of the fire damage at the Cement City, Mich., cement plant of the Consolidated Cement Corp.

A new tunnel system is being excavated to replace the old overhead carrier system for conveying the cement from the tube mills to the storage silos.—*Hudson* (Mich.) *Gazette*.

[This fire was reported in ROCK PRODUCTS May 24.—THE EDITOR.]

Current Prices of Ready-Mix Concrete

AMARILLO, TEX.—Prices per cu. yd.*

Lime Mortar

Mix	
1–4	6.50
1–4½	6.25
1–5	6.00

Terrazzo

Mix	
1–3 –0	9.00
1–3½–0	8.50
1–4 –0	8.00
1–4½–0	7.75
1–5 –0	7.50

Topping

Mix	
1–1 –0	13.75
1–1½–0	12.75
1–2 –0	11.75
1–2½–0	11.25
1–3 –0	10.75
1–3½–0	10.25

Base—Strength

4000 lb. per sq. in.	9.50
3500 lb. per sq. in.	9.00
3000 lb. per sq. in.	8.75
2500 lb. per sq. in.	8.50
2000 lb. per sq. in.	8.25
1500 lb. per sq. in.	8.00

Base

Mix	
1–2 –3½	9.25
1–2¼–4	9.00
1–3½–4½	8.00
1–3 –5	8.00
1–4 –6	7.25

*For orders of 50 cu. yd. or more, prices are 75c less per cu. yd. than quoted. Free delivery within city limits for 1 cu. yd. or more per load; $1.00 per load extra for less than 1 cu. yd. loads, except to finish a job. Additional charge of 10c per mile per cu. yd. for deliveries outside of city limits.

BELLINGHAM, WASH.—Prices per cu. yd.¶

Mix	Retail, f.o.b. bunkers	In carloads
1–3–4	6.85	6.10
1–3–5	6.51	5.75
1–2–3	7.85	6.91
1–2–4	7.27	6.50

¶Additional charges for delivery to various zones. First zone, added charge of 75c per cu. yd.; second zone, added charge of $1.05; third zone, added charge of $1.40; fourth zone, added charge of $1.75.

BOSTON AND CAMBRIDGE, MASS.—Price per cu. yd. for orders of 30 cu. yd. and over.‡

Mix	
1–2 –4	7.25
1–3 –6	6.75
1–2½–5	7.00
1–2 –3	7.70
1–1½–3	7.80
1–1 –2	8.55
1–2	10.25

‡Discount of 50c per cu. yd. allowed on deliveries made between the 1st and 15th of the month if bill is paid on or before the 25th and on deliveries made between 15th and 30th if paid on or before the 10th of following month.

CHAMPAIGN, ILL.†—Prices per ton (weight, 4000 lb. per cu. yd.)

Mix	
1–2–3	5.25
1–3–5	4.50
1–2–4	4.75

† 5% trade discount to contractors. Prices to both contractor and consumer subject to cash discount of 5% for payment by 10th of month following del. For quick strength concrete, 1–2–3 mix, extra charge of $1.50 per ton; 1–2–4 mix, $1 per ton extra. Added charge of 25c per ton for the use of chloride, lime or Celite in any wet mix. For heating concrete, 12½c extra per ton. For topping, any mix, $1.35 for each sack of cement used.

COLUMBUS, OHIO—Delivered prices per cu. yd.

Mix	Zones§ 1	2	3	4	5	6	7	8	9	10
1–1½–3	6.05	6.20	6.35	6.50	6.65	6.80	6.95	7.10	7.25	7.40
1–2 –3	5.80	5.95	6.10	6.25	6.40	6.55	6.70	6.85	7.00	7.15
1–2 –3½	5.60	5.75	5.90	6.05	6.20	6.35	6.50	6.65	6.80	6.95
1–2 –4	5.40	5.55	5.70	5.85	6.00	6.15	6.30	6.45	6.60	6.75
1–2½–4	5.25	5.40	5.55	5.70	5.85	6.00	6.15	6.30	6.45	6.60
1–3 –4	5.15	5.30	5.45	5.60	5.75	5.90	6.05	6.20	6.35	6.50
1–2½–5	5.00	5.15	5.30	5.45	5.60	5.75	5.90	6.05	6.20	6.35
1–3 –5	4.90	5.05	5.20	5.35	5.50	5.65	5.80	5.95	6.10	6.25
1–3 –6	4.75	4.90	5.05	5.20	5.35	5.50	5.65	5.80	5.95	6.10
1–4 –8	4.50	4.65	4.80	4.95	5.10	5.25	5.40	5.55	5.70	5.85
1–2	7.45	7.60	7.75	7.90	8.05	8.20	8.35	8.50	8.65	8.80
1–3	6.60	6.75	6.90	7.05	7.20	7.35	7.50	7.65	7.80	7.95

§All zones radiating from center of city. Zone 1 is one mile in radius, zone 2 is two miles in radius, zone 3 is three miles in radius, etc. Cash discount: 25c per cu. yd. 10th of month following date of delivery. Orders for less than 2 cu. yd. will carry same haul charge as 2 cu. yd. Orders for 2 cu. yd. or over will be delivered in full loads at 2 yd. or more. No extra charge will be made for finishing load if less than 2 cu. yd. Fifteen minutes allowed to unload. Additional time charged at rate of $2.00 per hour. All prices subject to revision to conform to current costs of materials.

DALLAS, TEX.†

Strength	Slump ½ in. to 1 in.	3 in. to 4 in.	6 in. to 7 in.
1500	5.25	5.45	5.75
2000	5.55	5.75	6.05
2500	5.80	6.00	6.30
3000	6.15	6.45	6.75

Fixed Mixes (any slump)

1–2½–5	6.45	1–2–4	6.75
1–1½–3	7.45		

†Prices subject to 2% 15 days and are based on quantities of 50 to 999 cu. yd. and on delivery in 2½-cu. yd. loads within Zone 1, which extends about 1½ miles from either of two plants. Zone charges are approximately 10c per cu. yd. per mile beyond the Zone 1 limit. On quantities under 50 cu. yd. add 20c and on quantities over 1000 cu. yd. deduct 30c.

CLEVELAND, OHIO (a)—Prices per cu. yd. to contractors for orders of 2 cu. yd. or more.

Public Square basing point
Aggregate: Limestone

Mix	1st mile	2nd mile	3d mile (Maximum)
1–1 –2	7.50	7.75	8.00
1–2 –3	6.30	6.55	6.80
1–2 –4	6.00	6.25	6.50
1–2½–3½	6.00	6.25	6.50
1–2½–4	5.80	6.05	6.30
1–3 –4	5.70	5.95	6.20
1–2½–5	5.60	5.85	6.10
1–3 –5	5.50	5.75	6.00
1–3 –6	5.40	5.65	5.90
1–4 –8	5.25	5.50	5.75
1–2 Finish	7.50	7.75	8.00
1–2½ Finish	7.00	7.25	7.50
1–3 Finish	6.50	6.75	7.00

Basing point: Windfall Road and Broadway, Bedford, Ohio
Aggregate: Bedford gravel

Mix	Miles 1st	2nd	3rd	4th	5th	6th	7th*
1–1 –2	6.50	6.75	7.00	7.25	7.50	7.75	8.00
1–2 –3	5.30	5.55	5.80	6.05	6.30	6.55	6.80
1–2 –4	5.00	5.25	5.50	5.75	6.00	6.25	6.50
1–2½–3½	5.00	5.25	5.50	5.75	6.00	6.25	6.50
1–2½–4	4.80	5.05	5.30	5.55	5.80	6.05	6.30
1–3 –4	4.70	4.95	5.20	5.45	5.70	5.95	6.20
1–2½–5	4.60	4.85	5.10	5.35	5.60	5.85	6.10
1–3 –5	4.50	4.75	5.00	5.25	5.50	5.75	6.00
1–3 –6	4.40	4.65	4.90	5.15	5.40	5.65	5.90
1–4 –8	4.25	4.50	4.75	5.00	5.25	5.50	5.75
1–2 Finish	7.00	7.25	7.50	7.75	8.00*	.....	.....
1–2½ Finish	6.50	6.75	7.00	7.25	7.50*	.....	.....
1–3 Finish	6.00	6.25	6.50	6.75	7.00*	.....	.....

*Maximum.

(a) Industrials or consumers 50c more than contractors. Extra charge for concrete delivered nights, Sundays or holidays, $1.00 per cu. yd. over daytime schedule. For high-early-strength or waterproofing cements additional charge of $2.00 per cu. yd. For waterproof concrete using Anti-Hydro with manufacturer's guarantee, additional charge of $2.00 per cu. yd. For orders less than 2 cu. yd. add $1.00 per yd. to above prices. Prices quoted are based upon normal discharge of load within 20 minutes after arrival of truck. A demurrage charge of $1.00 for each 15 minutes thereafter.

DES MOINES, IOWA—Prices per cu. yd. (b)

(Made with ¾-in. gravel for structural work)

Mix	Slump	Plant price	Zone A	B	C	D
1–2½–5	2-in.	6.00	6.50	6.75	7.00	7.25
1–2½–5	6 in.	6.25	6.75	7.00	7.25	7.50
1–2 –4	2 in.	6.50	7.00	7.25	7.50	7.75
1–2 –4	6 in.	6.75	7.25	7.50	7.75	8.00
1–2 –3½	2 in.	7.00	7.50	7.75	8.00	8.25
1–2 –3½	6 in.	7.25	7.75	8.00	8.25	8.50
1–2½–3	2 in.	7.50	8.00	8.25	8.50	8.75
1–2½–3	6 in.	7.75	8.25	8.50	8.75	9.00

(Made with pea gravel for cellar and sidewalks)

Mix	Slump	Plant price	Zone A	B	C	D
1–2½–5	2 in.	5.75	6.25	6.50	6.75	7.00
1–2½–5	6 in.	6.00	6.50	6.75	7.00	7.25
1–2 –4	2 in.	6.25	6.75	7.00	7.25	7.50
1–2 –4	6 in.	6.50	7.00	7.25	7.50	7.75
1–2 –3½	2 in.	6.75	7.25	7.50	7.75	8.00
1–2 –3½	6 in.	7.00	7.50	7.75	8.00	8.25
1–2½–3	2 in.	7.25	7.75	8.00	8.25	8.50
1–2½–3	6 in.	7.50	8.00	8.25	8.50	8.75

(b) Discount of 50c per cu. yd. allowed on deliveries made between the 1st and 15th of the month if bill is paid before the 25th and on deliveries made between 16th and 30th if paid before the 10th of following month. Quick setting $2.00 per cu. yd. extra; waterproofing, $2.00 per cu. yd. extra. Each zone approximately one mile.

FAIRMONT, W. VA.—Prices per cu. yd. (c)

Mix	Quantity	Delivered	Called for
1–2–4	Less than 1 cu. yd.	11.00	10.00
1–2–4	From 1 to 4 cu. yd.	10.00	9.00
1–2–4	From 5 to 10 cu. yd.	9.50	8.50
1–2–4	From 11 to 49 cu. yd.	9.00	8.00
1–2–4	From 50 cu. yd. and up	8.50	7.50

(c) For 1–2–3 mix add 50c per cu. yd. to prices quoted; for 1–3–5 mix deduct 50c per cu. yd. from prices quoted.

INDIANAPOLIS, IND.—Prices per cu. yd. in small quantities, for delivery within 3-mile haul.

Mix	
1 bbl. cement/cu. yd. concrete	5.50
1¼ bbl. cement/cu. yd. concrete	6.00
1½ bbl. cement/cu. yd. concrete	6.50

LOS ANGELES, CALIF.¶—Prices per cu. yd.

Mix	1–5 yd.	5–25 yd.	25 or more	Mix	1–5 yd.	5–25 yd.	25 or more
3–50–50	8.25	7.25	6.25	1–2¾–3½	10.00	9.00	8.00
4–50–50	8.85	7.85	6.85	1–2 –4	9.85	8.85	7.85
1–3 –6	8.95	7.95	6.95	1–2½–3½	10.10	9.10	8.10
1–3 –5	8.95	7.95	6.95	1–2½–3¾	10.05	9.05	8.05
1–2½–5	9.50	8.50	7.50	1–2 –3	10.60	9.60	8.60
1–3 –4	9.75	8.75	7.75	1–2 –3½	10.20	9.20	8.20

¶Above prices for deliveries in Zone 1 (1-5 miles). Added charge of 75c per cu. yd. for deliveries in Zone 2 (5 to 10 miles). Added charge of $1.50 for Zone 3 (10 to 15 miles). Discount of 50c per cu. yd. if payment is made within 10 days from delivery.

MEMPHIS, TENN.—Prices per cu. yd. delivered in city.†

Strength	Portland	"Incor"	Strength	Portland	"Incor"
1800 lb.	6.50	7.30	3000 lb.	8.00	9.25
2000 lb.	7.00	8.00	3500 lb.	8.60	10.00
2500 lb.	7.50	8.50	4000 lb.	9.80	11.75

†Above prices based on gravel for aggregate. If stone is wanted for aggregate, additional charge of $1.00 per cu. yd. is made to above prices. 5% cash discount for payment 10th of month following date of invoice.

MILWAUKEE, WIS.—Prices per cu. yd. (e)

28-day breaking strength:	Per sq. in.	Slump 2 to 4 in.	Slump 4 to 6 in.	Slump 6 to 8 in.
Garage footings and walls	2000 lb.	4.50	4.75	5.00
Footings, floors, walls	3000 lb.	5.50	5.75	6.00
City paving	3300 lb.	4.75	.....	.....
Sidewalks, curbs	4000 lb.	5.75	6.00	6.25
24-hour high early strength	5000 lb.	7.00	7.50	8.00

Sold on old mixture method, 2- to 4-in. slump; 4- to 6-in. slump; 6- to 8-in. slump.

	Mix	
Walls—Garage footing	1–3–5	4.50
City paving	1–2–4	4.75
Garage floors, walls	1–3–3	5.50
Sidewalk	1–2–3	5.75
Special strength (machine bases)	1–1½–2½	7.00
Facing	1–3	8.00
Facing	1–2	10.00

(e) Discount of 25c per cu. yd. if paid by 10th of following month.

MONTGOMERY, ALA.—Prices per cu. yd. delivered in city limits. (g)

Mix		Mix	
1–2 –4	6.60	1–3–6	5.95
1–2½–5	6.20	1–2 mortar topping	11.50

(g) Discount of 25c per cu. yd. for payment in 30 days. Special quotations for quantity orders.

MORGANTOWN, W. VA.—Prices for jobs of 1 to 10 cu. yd., delivered (f)

Mix		Mix	
1–2–3	9.25	1–2½–4	8.65
1–2–4	8.75	1–2½–5	8.25

(f) Prices subject to cash discount of 25c per cu. yd. for payment 15 days from date of invoice.

NEW ORLEANS, LA. (h)—Plant prices per cu. yd. for 30 yd. or less.

Mix	Cement Portland	Cement "Incor"	Mix	Cement Portland	Cement "Incor"
1–4 –8	5.15	6.10	1–2–2	7.70	10.25
1–3 –6	5.75	7.00	2–3–6	8.05	10.55
1–3 –5	5.95	7.35	2–3–3	8.85	12.00
1–2½–5	6.25	7.80	1–1½ topping	10.95	15.80
1–2½–4	6.40	8.15	1–2 topping	9.30	13.25
1–2 –4	6.75	8.60	1–3 topping	7.85	10.85
1–2 –3	7.20	9.40			

Plant prices per cu. yd., 30 cu. yd. or over:

Mix	Cement Portland	Cement "Incor"	Mix	Cement Portland	Cement "Incor"
1–4 –8	4.65	5.45	1–2–2	6.95	9.15
1–3 –6	5.15	6.25	2–3–6	7.25	9.45
1–3 –5	5.35	6.55	2–3–3	8.00	10.70
1–2½–5	5.65	7.00	1–1½ topping	9.85	14.10
1–2½–4	5.80	7.25	1–2 topping	8.40	11.80
1–2 –4	6.05	7.70	1–3 topping	7.05	9.60
1–2 –3	6.50	8.40			

(h) All prices subject to 5% 15 days, 30 days net. Haulage based on various zones.

NEWARK AND HARRISON, N. J.§

1–2 –4	6.50	1–3– 6	6.25
1–3 –5	6.00	1–2½–5	6.50

§Discount of 2% if paid by 10th of month following delivery.

NEW YORK CITY, N. Y.‡—Prices per cu. yd.

Manhattan and Bronx Mix		Queens Mix	
1–1½–3	10.00	1–1½–3	8.50
1–2 –4	9.25	1–2 –4	8.00
1–2½–5	8.75	1–2½–5	7.75
1–3 –6	8.25	1–3– 6	7.50

Westchester County (within radius of 7 miles)

1–1½–3	9.25	1–2½–5	8.00
1–2 –4	8.50	1–3 –6	7.50

Brooklyn

Mix	Under 50 cu. yd.	Over 50 cu. yd.	Mix	Under 50 cu. yd.	Over 50 cu. yd.
1–1½–3	9.50	8.50	1–2½–5	9.00	7.75
1–2 –4	9.25	8.00	1–3 –6	8.75	7.50

‡Special designed mixes on the strength basis priced according to the strength desired.

OMAHA, NEB.*—Prices per cu. yd. for quantities from 1 to 300 yd., delivered anywhere within the city.

28-day strength		28-day strength	
No. 1. 3500 lb. sq. in.	6.75	No. 3. 2500 lb. sq. in.	6.25
No. 2. 3000 lb. sq. in.	6.50	No. 4. 2000 lb. sq. in.	6.00

Transit-Mix Concrete

28-day strength		28-day strength	
No. 1. 3600 lb. sq. in.	6.90	No. 3. 2600 lb. sq. in.	6.40
No. 2. 3100 lb. sq. in.	6.65	No. 4. 2100 lb. sq. in.	6.15

*Sand-gravel mix used as aggregate. No. 1, 6 sacks cement per cu. yd. concrete; No. 2, 5½ sacks cement; No. 3, 5 sacks cement; No. 4, 4½ sacks cement. For high-early-strength concrete using "Quikard" or other supercement, add $2.50 per cu. yd.

PITTSBURGH, PENN.—Prices for ready-mixed concrete. Prices shown are per cu. yd. delivered, up to 50 cu. yd. On over 50 cu. yd., reduction of $1.00 per cu. yd. (j)

Mix	Strength		Mix	Strength	
1–1½–2½	4000 lb.	7.45	1–2½–4½	2500 lb.	6.60
1–2 –3	3500 lb.	7.10	1–2½–5	2500 lb.	6.45
Class A	3500 lb.	6.95	1–3 –5	2000 lb.	6.35
1–2½–3½	3000 lb.	6.85	1–3 –6	1500 lb.	6.25
1–2 –4 (Class B)	3000 lb.	6.75			

(j) Class A concrete is a special concrete prepared for the city of Pittsburgh. Prices vary according to zones. Dealer's commission of 50c per cu. yd. allowed in all zones with exception of Yellow Zone. No commission allowed over 200 cu. yd. Prices subject to cash discount of 25c per cu. yd. for payment 15 days from date of invoice.

PUEBLO, COLO.—Prices per cu. yd.‖

Ready-Mixed Concrete

	Zone 1	Zone 2	Zone 3	Strength, 28-day test
Grade A	7.40	7.60	7.80	3000-lb.
Grade B	7.10	7.30	7.50	2700-lb.
Grade C	6.75	6.95	7.15	2400-lb.
Grade D	6.60	6.80	7.00	2100-lb.
Grade G	6.10	6.30	6.50	1500 lb.

Cement Mortar Mix	Zone 1	Zone 2	Zone 3	Mix	Zone 1	Zone 2	Zone 3
1–2	10.00	10.20	10.40	1–3	8.50	8.70	8.90

‖Deduct 50c per cu. yd. for orders of 10 yd. or more. For delivery outside of city, add 20c per mile beyond Zone 3.

ROCHESTER, N. Y.—Prices per cu. yd.

Mix	Plant price	Prices for delivery to various zones Zone 1	2	3	4	5	6	7
1–2 –3	7.00	7.75	7.90	8.05	8.20	8.35	8.50	8.65
1–2¾–3½	6.55	7.30	7.45	7.60	7.75	7.90	8.05	8.20
1–3 –4½	6.20	6.95	7.10	7.25	7.40	7.55	7.70	7.85
1–4 –5	6.00	6.75	6.90	7.05	7.20	7.35	7.50	7.65
1–5 –6	5.65	6.40	6.55	6.70	6.85	7.00	7.15	7.30

SAN ANTONIO, TEX.—Prices per cu. yd. in first (1-mile) zone.‡

Mix		Mix	
1–1½–3	6.90	1–2½–5	6.00
1–2 –4	6.30	1–3 –5	5.80
1–2½–4½	6.20	1–3 –6	5.70
		1–4 –8	5.30

‡For deliveries outside of first zone (1 mile) add 25c per cu. yd. each mile. Deduction of 50c per cu. yd. on large orders for delivery within one mile of plant.

SAN JOSE, CALIF.—Prices per cu. yd. delivered within one mile of plant. (k)

Mix	Up to 5 cu.yd.	Over 5 cu.yd.	Mix	Up to 5 cu.yd.	Over 5 cu.yd.
1–6	9.00	8.50	1– 9	8.00	7.50
1–7	8.50	8.00	1–12	7.00	6.50

(k) For deliveries outside of this area add 30c per cu. yd. per mile. Cash discount of 50c per cu. yd. if paid in full by 10th day of following month.

SANTA CRUZ, CALIF.—Price per cu. yd. delivered within two-mile radius of plant. (l)

Mix	Over 5 cu. yd.	Less than 5 cu. yd.	Mix	Over 5 cu.yd.	Less than 5 cu.yd.
1–6 (6 sacks cement)	8.50	9.00	1–8 (4½ sacks cement)	7.60	8.10
1–7 (5 sacks cement)	8.00	8.50	1–9 (4 sacks cement)	7.40	7.90

(l) For deliveries outside of this area add 30c per cu. yd. per mile. Cash discount of 50c per cu. yd. if paid in full by 10th day of following month.

SPRINGFIELD, ILL.—Prices per cu. yd.

Mix		Mix	
1–3 –6	8.00	1–2 –3½	9.00
1–3 –5	8.20	1–2 –3	9.20
1–2½–4	8.45	1–1½–3	9.40
1–2 –4	8.75	1–1 –2	10.50

WATSONVILLE, CALIF.—Prices per cu. yd.‖

Mix		Mix	
1–6	9.90	1– 9	8.50
1–7	9.30	1–12	7.75
1–8	9.00		

‖Prices are for delivery anywhere within city limits, and are subject to cash disc. of 50c cu. yd. for payment on or before 10th day of following month.

WILKES-BARRE, PENN.—Prices per cu. yd. delivered within one mile of plant, subject to discount of 25c per cu. yd. for payment within 10 days from date of delivery. Extra charge of 15c per cu. yd. for each additional mile.

Mix	Gravel	Stone	Mix	Gravel	Stone
1–2 –3	7.60	7.90	1–3–5	6.75	7.05
1–2 –4	7.30	7.60	1–3–6	6.75	7.05
1–2½–5	7.00	7.30			

The Rock Products Market

Wholesale Prices of Aggregates

(F.O.B. Plant or City Designated)

Prices given are for crushed limestone per ton, unless otherwise stated	Crushed stone ¼ in. Screenings, ¼ in. down	Crushed stone ½ in. and less to 2½ in	Sand ¼ in. and less	Gravel, ½ in. and less to 2 in.	Slag Screenings, ¼ in. down	Slag Crushed, ½ in. and less to 3 in. and larger
EASTERN:						
Albany, N. Y. (u)			.90*	1.35*		
Alexander, N. Y.			.65d	.65d		
Bethlehem, Penn.					.50– .60	.50– .90
Boston, Mass. (g)			1.05	1.60		
Buffalo, N. Y.	1.25¶	1.25¶	1.00–1.10d	1.00–1.10d	1.50d	1.50–1.60d
Clarence, N. Y.			.60v	.60v		
Hillsville, Penn.	.85	1.25				
Montoursville, Penn.			.50– .60	.40– .50		
New York City			1.00*	1.50*		
Philadelphia, Penn. (trap rock)	3.51		1.35	1.50		
Port Jefferson, N. Y.			.50*	1.25*		
Utica, N. Y.	.50– .75	1.00–1.25	.60– .75	.75–1.00		
Washington, D. C.			.85	1.30		
CENTRAL:						
Alton, Ill.	1.75					
Chicago, Ill.			.93½	1.02½		
Davenport, Iowa	1.00	1.25				
Dubuque, Ia.	1.00					
Eau Claire and Chippewa Falls, Wis.			.30– .40	.70– .80		
Evansville, Ind.			.55p	.70p		
Greenbush, Mich.			.40x	.70y		
Grand Rapids, Mich.			.30– .40	.60– .70		
Hannibal, Mo.	1.00	1.25				
Indianapolis, Ind.			.40– .50*	.54– .81*		
McCook, Ill.	.60	.60				
Middle Brook, Mo. (granite)	3.00–4.00	2.00–3.00				
Milwaukee, Wis.	1.14	1.24	.84w	.94w		
Riverton, Ind.			.40– .60	.50– .70		
Stone City, Iowa	.75	1.00				
St. Louis and Maplewood, Mo.	1.00	1.25				
St. Paul, Minn.		1.25	.35	1.25		
Toledo, Ohio	1.16	1.66			1.10	1.20
Waukesha, Wis.	.90	.90	.35	.45		
SOUTHERN:						
Atlanta, Ga. (granite)	1.16	1.56				
Birmingham and Ensley, Ala.					.55	.80–1.25
Cartersville, Ga.	.90	.90				.80
Chico, Tex.	.50u	.90u				
(Trap rock)	2.25u	1.00u				
Columbia, S. C. (granite)	.50	1.40				
Ft. Spring, W. Va.	.35	1.15–1.35q				
Houston, Tex.			1.25*	1.81k		
Knoxville, Tenn.	.55	.80	.70	1.00		
Longdale, Va.	1.00	1.15			.75	1.05–1.25
Montgomery, Ala.			.25– .35	.50– .60		
New Braunfels, Tex.	.50	.90				
Olive Hill, Ky.	.50–1.00	.90				
Roseland, La.			.40	.75		
Woodward, Ala.					.55‡	.90–1.25‡
WESTERN:						
Denver, Colo. (h)			1.25*	1.75*		
Ft. Gibson, Okla.				.80t		
Long Beach, Calif. (trap rock)		1.50	.80			
Phoenix, Ariz. (n)			1.65	1.50		
Salt Lake City, Utah			.65‡	.65‡		
San Francisco, Calif. (Bay points)			1.45s	1.45s		
Seattle, Wash.			1.00*	1.00*	1.25	1.25
Tulsa, Okla.	.50– .72r	1.10–1.37r	.50a			

*Prices per cu. yd. ¶F.o.b. cars. †Less 10c per ton monthly settlements disc. ‡Prices less 5c disc. per ton for payment 15th following month. (a) F.o.b. Tulsa for Okla. deliveries only; disc. 3%, 10 days. (b) ½ in. to 1½ in. (c) 1½ in. and less. (d) F.o.b. trucks at plant. (e) Delivered in truck loads. (f) ¾ in. to 2½ in. (g) Delivered to job by truck, Boston. (h) Pea gravel, per cu .yd., 1.15. (k) Less 10c cash disc. (m) 2 in. and less. (n) Per cu. yd. in city limits. (p) Loaded on cars per ton at plant. (q) ¼ to ½ in., 1.35; ¼ to ¾ in., 1.15; all other sizes to 2 in., 1.00; 2½ in., 90c. (r) Less 15c per ton for cash 10 days. (s) Plus 5c R.R. surcharge. (t) ¼ in. to 1½ in. washed river gravel, disc. 5%, 10 days. (u) F.o.b. plant. (v) F.o.b. cars or trucks. (w) Also 1.10–1.50 per cu. yd. (x) Concrete sand. (y) Washed pebble, 70c; road gravel, 1½ in., per ton, 50c; ¾ in., 35c.

Masonry Cement

Packed in paper sacks. Prices, f.o.b. cities named, include cost of sacks.

	Per bag	Per bbl.
Chicago, Ill.	.46¾	1.87
Cincinnati, Ohio	.44	†1.76
Cleveland, Ohio	.....	†1.57
Columbus, Ohio	.....	†1.71
Dayton, Ohio	.....	†1.62
Detroit, Mich.	.47¼	1.89
Indianapolis, Ind.	.....	†1.62
Louisville, Ky.	.41	1.64
Memphis, Tenn.	.49¼	1.97
St. Louis, Mo.	.46¼	1.85
Toledo, Ohio	.....	†1.57

†Subject to cash discount of 10c per bbl. for payment within 15 days from date of invoice.

Mica

Prices given net, f.o.b. plant or shipping point.

Martinsville, Va.—Mica schist, per ton	10.00
Mine scrap, per ton	16.00
Penland, N. C.—Mine scrap, per ton, 16.00; dry, ground, 20.00; roofing mica, per ton	18.00
Franklin, N. C.	
Mine scrap, per ton	15.00
Ground mica, 20 mesh, 21.00; 40 mesh, 22.00; 60 mesh, 35.00; 100 mesh	42.00
Wet ground mica, per lb.	.03

Agricultural Limestone

(Crushed)

Alton, Ill.—90% thru 100 mesh	4.50
Cartersville, Ga.—Pulverized limestone, per ton, 1.75; 50% thru 50 mesh, per ton	1.25
Chico, Tex.—Pulverized limestone, per cwt., sacked, 1.00; agriculturl limestone, 90% thru 100 mesh, per ton, f.o.b. plant	1.00
Colton, Calif.—Analysis, 95.97% $CaCO_3$; 1.31% $MgCO_3$ all thru 14 mesh down to powder	3.50
Davenport, Iowa — Analysis, 90-98% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 4 mesh; bulk	1.00
Dolomite, Calif.—Analysis, 54% $CaCO_3$; 45% $MgCO_3$; 99% thru 10 mesh, per ton, 2.10; 49% thru 60 mesh, ¼-in. to dust, per ton	1.70
Dubuque, Ia.—Analysis, 64.04% $CaCO_3$; 29.54% $MgCO_3$; 90% thru 50 mesh, per ton	1.00
Fort Spring, W. Va.—Analysis, 90% $CaCO_3$; 3% $MgCO_3$; 90% thru 100 mesh, per ton, bulk, 1.25; in 80-lb. bags	2.75
Gibsonburg, Ohio—99% thru 10 mesh, 60% thru 100 mesh; in bags, per ton, 3.50; in bulk, per ton	2.50
Agricultural meal, 100% thru ⅜-in. mesh screen, 25% thru 100 mesh screen, ton	1.00
Hillsville, Penn.—Pulverized limestone, per ton, bulk, 2.50; in bags	3.25
Knoxville, Tenn.—80% thru 100 mesh; in bulk, 2.00; in bags	3.00
Lannon, Wis.—50% thru 50 mesh	1.50
Marion, Va.—Analysis, 80% $CaCO_3$; 20% $MgCO_3$; per ton	1.00
Marlbrook, Va.—Analysis, 97% $CaCO_3$ ½% $MgCO_3$; 50% thru 100 mesh, bulk, per ton, 1.90; in 100-lb. burlap bags	3.00
McCook, Ill.—Analysis, 55% $CaCO_3$; 45% $MgCO_3$. 90% thru 50 mesh, 50% thru 50 mesh, 90% thru 100 mesh, 50% thru 100 mesh, all per ton	.60
Olive Hill, Ky.—90% thru 4 mesh	1.00
Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh, and 45% thru 200 mesh, per ton	3.50
Stone City, Ia.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, per ton, 4.00; 50% thru 100 mesh	2.10
West Rutland, Vt. — Analysis, 96% $CaCO_3$; 1% $MgCO_3$; 100% thru 40 mesh, per ton, in bulk, 2.50; in 80-lb. bags, per ton	3.75

*Less 50c commission.

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis, 90-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton	6.00
Joliet, Ill.—Analysis, 48% $CaCO_3$; 42% $MgCO_3$; 90% thru 200 mesh (bags extra)	3.50
Waukesha, Wis.—90% thru 100 mesh	4.00

Roofing Slag

Prices given are per ton f.o.b. city named.

Bethlehem, Penn.	1.00–1.50‡
Buffalo, N. Y.	2.50†
Ensley and Birmingham, Ala.	2.05
Longdale, Va.	2.50
Toledo, Ohio	1.20¶
Woodward, Ala.	2.05*

*Less 5c ton disc. for pay. 15th following month.

†Price f.o.b. trucks at plant, subject to discount of 10c per ton for payment on or before the 15th of following month. ‡F.o.b. plant. ¶F.o.b. trucks, slag plant.

Portland Cement

	F.o.b. city named Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.66	2.64	.....
Atlanta, Ga.	.....	1.90†	2.95¶
Birmingham, Ala,	.....	1.58†	2.63¶
Boston, Mass.	.44½	1.78†	2.52¶
Charleston, S. C.	.....	1.93†	2.98¶
Cheyenne, Wyo.	.52¼	2.09	.....
Chicago, Ill.	.....	1.35†	2.00¶
Cincinnati, Ohio	.....	1.42†	2.07¶
Cleveland, Ohio	.....	.....	2.08¶
Columbus, Ohio	.....	.....	2.06¶
Dayton, Ohio	.....	.....	1.93¶
Denver, Colo.	.50	2.00	.....
Detroit, Mich.	.....	1.47†	2.12¶
Indianapolis, Ind.	.....	1.41†	2.06¶
Jackson, Miss.	.....	1.98†	3.03¶
Jacksonville, Fla.	.....	2.00†	3.05¶
Kansas City, Mo.	.....	1.94†	1.04¶
Los Angeles, Calif.	.57½	2.30	.....
Louisville, Ky.	.....	1.45†	2,10¶
Memphis, Tenn.	.....	1.77†	2.82¶
Milwaukee, Wis.	.....	1.45†	2.04¶
Montreal, Que.	.....	1.70§	.....
New Orleans, La.	.....	1.86†	2.96¶
New York, N. Y.	.37¼	1.49†	2.28¶
Portland, Ore.	.....	2.05–2.40‡	.....
Reno, Nev.	.....	2.80‡	.....
St. Louis, Mo.	.....	1.37†	2.02¶
San Francisco, Calif.	.....	2.05‡	.....
Savannah, Ga.	.....	1.93†	2.98¶
Seattle, Wash.	.....	2.30–2.55	2.80c
Toledo, Ohio	.....	.....	2.02¶
Topeka, Kan.	.....	2.15†	1.65¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Hudson, N. Y.	.....	*1.21–‖1.36†	2.33¶
Lime & Oswego, Ore.	.....	2.05	.....
Limedale, Ind.	.....	1.10†	.....

NOTE: Unless otherwise noted, prices quoted are net prices, without charge for bags. Add 40c per bbl. for bags. †Includes 10c cash disc. ‡Subject to **2% discount payment 10th of month following invoice date. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c discount** 15 days. (c) Quick-hardening "Velo," packed in paper bags, 10c discount 10 days. §Sales tax included at 6%. *F.o.b. cars. ‖Trucks, mill.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink (a)	¶12.50–‖14.50	¶12.50–‖14.50
Cardiff, Md. — Crushed green marble (a)	¶12.50–‖14.50	¶12.50–‖14.50
Cranberry Creek, N. Y.	.....	‖12.00
Crown Point, N. Y.—Per ton	12.00	12.00
Los Angeles, Calif.—(a)		
White	¶10.00–‖12.50	¶10.00–‖12.50
Snowflake	.....	¶10.00–‖12.50
Golden, browns, grey, blues, blacks	¶15.50–‖17.50	¶15.50–‖17.50
Dolomite, Calif. (Lone Pine)—(a)		
White	¶8.00– ‖8.80	¶8.00– ‖8.80
Snowflake	.....	¶8.00– ‖8.80
Golden, browns, grey, blues, blacks	¶13.00–‖13.80	¶13.00–‖13.80
Middlebrook, Mo.	.....	20.00– 25.00
Middlebury, Vt.—White	.....	¶9.00–‖10.00a
Randville, Mich.—Crystalite, crushed white marble, bulk	4.50	4.50– 5.00
Tuckahoe, N. Y.	5.00	.....
Warren, N. H., per ton	.....	4.00– 5.00

¶C.L. ‖L.C.L. *Per 100-lb. (a) Including bags.

Art and Cast Stone Aggregates

Cardiff, Md.—Green marble fines in carloads; bulk, 7.50; in bags	10.00
Los Angeles, Calif.—Dolomite aggregates, all sizess, white†	¶7.30 ‖9.50
Dolomite special cast stone, wet-cast aggregate, white, ¼-in. to dust	a5.10

† 100-lb. sacks. ¶C.L. ‖L.C.L. (a) In open cars.

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Eau Claire, Wis.	.....	.60
Ohlton, Ohio	1.50	1.50
San Francisco, Calif.	3.50–5.00	3.50

Glass Sand

(Silica sand is quoted washed, dried and screened)

Kasota, Minn.—Unscreened, per ton	1.50
Ohlton, Ohio	2.40
Ottawa, Ill.—(Per ton, f.o.b. Ottawa)	1.25
San Francisco, Calif.	4.00–6.00
Silica, Va.	2.25–2.75
South Vineland, N. J.	1.50

Chicken Grits

Chico, Tex.—(Limestone) packed in 100-lb. sacks, per cwt., f.o.b. plant	1.00
Cranberry Creek, N. Y.—Per ton	12.00
Davenport, Iowa—High calcium carbonate limestone, in bags, L.C.L., per ton	6.00
Gibsonburg, Ohio.—(Agstone)	5.00– 5.25
Hannibal, Mo.—(Limestone), per ton	10.00
Hartford, Conn.—Per ton	1.80
Indianapolis, Ind.—Per ton	.30
Los Angeles, Calif.—Marble grits, per ton, incl. sacks	7.50–12.50
Maplewood, Mo.—(Limestone), per ton	10.00
Middlebury, Vt.—Per ton (a)	**10.00**
New Braunfels, Tex. — (Limestone), per ton, in bulk	3.50
New York City—Per cu. yd.	1.00
Port Clinton, Ohio—(Gypsum), per ton	6.00
Port Jefferson, N. Y.—Per cu. yd.	.50
Salt Lake City, Utah—Per ton	.60
Utica, N. Y.—(Limestone), per ton	3.50
Warren, N. H.—(Aggregate)	7.80–11.00
Waukesha, Wis.—(Limestone), per ton	7.00

(a) F.o.b. Middlebury, Vt.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chester, Vt.—Finely ground talc (carloads), Grade A—99-99½% thru 200 mesh, 7.50–8.00; Grade B, 97-98% thru 200 mesh	6.50– 7.00
1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of burlap bags. Terms 1%, 10 days.	
Emeryville, N. Y.:	
Crude ground talc (200 mesh), bags	13.75
Crude ground talc (325 mesh), bags	14.75
Henry, Va.:	
Crude mine run, per ton	3.50– 4.00
Ground talc (150-200 mesh), in bags	4.80– 7.25
Joliet, Ill.:	
Ground talc, 200 mesh, in bags:	
California talc	30.00
Southern talc	20.00
Illinois talc	10.00
Natural Bridge, N. Y.:	
Ground talc (325 mesh), in 50-lb., 100-lb. and 200-lb. bags, per ton	10.00–20.00

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; lowest net prices per ton f.o.b. plant

City or shipping point	Molding: Fine	Molding: Coarse	Molding: Brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	1.75	1.75	1.75	.....	.....	3.00	.....
Chippewa Falls, Wis.	.....	.....	.....	.....	.....	2.00g	.....
Elco, Ill.	Amor. silica, 90-99½% thru 325 mesh,						$10.00
Kasota, Minn.	.....	.....	.....	.....	.....	.....	1.25
Montoursville, Penn.	.....	.....	.....	1.50a	.....	.....	.....
New Lexington, Ohio	2.00	1.25	.....	.....	.....	.....	.....
Ohlton, Ohio	1.50	1.50	.....	1.50	1.50	1.50	.....
Ottawa, Ill.	.....	.....	.....	.....	.....	3.50	.....
San Francisco, Calif. (f)	3.50	5.00	3.50	2.50c	5.00	3.00d	1.75e

Silica, Va.—Ground silica thru 140 mesh, 8.00.
South Vineland, N. J.—Dry washed silica, 2.00 per ton.
Thebes, Ill. 2.00b

(a) To 1.60. (b) To 2.50 per ton, not washed, dried or screened. (c) To 4.50 per ton. (d) To 5.00. (e) To 2.50. (f) Ground sand, 120-200-325 mesh, per ton, 16.50. (g) To 3.00.

Wholesale Prices of Slate

Lowest prices f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200 mesh, 5.75 per ton in paper bags.

Slate Granules

Pen Argyl, Penn.—Color, blue-black, per ton 6.00*

*In 150-lb. burlap bags, plus 10c for each bag.

Roofing Slate

Prices per square—Standard thickness

City or shipping point	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Bangor, Penn.—						
No. 1 Bangor	9.50	14.00	20.00	24.00	35.00	45.00
No. 1 Ribbon	7.50	10.00	15.00	20.00	30.00	40.00
Chapman Quarries, Penn.—						
Smooth texture	9.00–11.00	.....	.....	.....	.....	.....
Rugged	8.25– 9.00	a12.50	b18.00	b21.50	d25.00	e30.00
Pen Argyl, Penn.	.....	11.20	16.10	18.90	25.90	32.20

Albion blue-grey roofing slate, No. 1 clear, 5.50–6.75; mediums, 5.50–6.25; No. 1 ribbon, 5.50–6.25; punching, all sizes, 35c per square.
(a) To 15.00. (b) To 26.50. (d) To 32.00. (e) To 37.00.

Prices are for standard preferred sizes (standard 3/16-in slates), smaller sizes sell for lower prices. Prices other than 3/16-in. thickness include nail holes.

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Lime Products

(Lowest carload prices per ton f.o.b. shipping point unless otherwise noted)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Bulk	Ground burnt lime, Bags	Lump lime In bulk	Lump lime In bbl
EASTERN:								
Berkeley, R. I.	12.00	11.00	10.50	13.00	.....	17.50	.....	21.00
Buffalo, N. Y.	5.50	4.75	4.75	10.50	5.00	7.00	5.00	.....
Cedar Hollow, Devault, Rambo and Swedeland, Penn.	.....	8.00c	8.00c	8.00c	7.00	8.00	8.00	.....
Lime Ridge, Penn.	.....	.....	8.00	.....	6.00	7.00	4.50	.....
CENTRAL:								
Cold Springs, Ohio	.....	4.75	4.75	.....	.....	.....	5.00	.....
White Rock, Gibsonburg, Marblehead, Tiffin, Ohio, and Huntington, Ind.	5.50	4.75	4.75	10.50	5.00	7.00	5.00	.....
Delaware, Ohio	5.50	4.75	4.75	6.50	.....	.....	5.00	.....
Woodville, Ohio	5.50	4.75	4.75	9.00	5.00	7.00	5.00	14.00
SOUTHERN:								
Cartersville, Ga.	.....	7.50	.....	.....	.....	.....	.....	.....
Keystone, Ala.	12.00	7.50	7.50	7.50	.....	.....	6.50§	.....
Knoxville, Tenn.	.....	7.50	7.50	7.50	.....	.....	6.50	12.65
WESTERN:								
Kirtland, N. Mex.	.....	.....	.....	.....	.....	.....	12.50d	.....
Little Rock, Ark.	.....	12.05	.....	12.05	.....	.....	9.90	17.10
San Francisco, Cal. (b)	18.50	16.00	11.00	.....	.....	18.50	.....	.....
San Francisco, Calif.	17.00	15.00	11.70	14.00*	11.70	.....	11.70‡	11.70†

(a) In 100-lb. bags. (b) Woodburnt lime. (c) In 50-lb. paper. (d) To 15.00. ¶In 200-lb. steel barrels. ‖Refund for return of barrels. †Plus 40c each for barrels. *To 16.00. ‡ To 13.00. §In barrels, 1.25 per bbl.

Stone-Tile Hollow Brick

Prices are net per thousand, f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Altadena, Calif.	45.00	55.00	65.00
Asheville, N. C.	30.00	40.00	50.00
Atlanta, Ga.	29.00	42.50	53.00
Auburn, Wash.	.....	50.00	65.00
Brownsville, Tex.	.....	53.00	62.50
Brunswick, Me.	29.50	42.25	55.00
Chula Vista, Calif.	32.50	42.50	50.00
Daytona Beach, Fla.	45.00	55.00	65.00
Frostproof, Fla.	45.00	65.00	75.00
Houston, Tex.	36.00	53.00	66.00
Klamath Falls, Ore.	50.00	60.00	70.00
Longview, Wash.‡	.....	50.00	60.00
Los Angeles, Calif.	29.00	39.00	45.00
Macon, Ga.	25.00	35.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	45.00	50.00	60.00
Mineola, N. Y.	40.00	50.00	60.00
Nashville, Tenn.*	32.00	50.00	60.00
New Orleans, La.	45.00	55.00	65.00
Norfolk, Va.	33.00	46.00	60.00
Palm Springs, Calif.	45.00	60.00	70.00
Passaic, N. J.	42.50	55.00	75.00
Pawtucket, R. I.	27.50	41.25	55.00
Presidio, Tex.	55.00	65.00	75.00
Roanoke, Va.	32.50	40.00	50.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50
Spartanburg, S. C.	32.50	40.00	52.50

Prices are for standard sizes—No. 4, size 3⅓x 4x12 in.; No. 6, size 3⅓x6x12 in.; No. 8, size, 3⅓x8x12 in. *Delivered on job. †10% discount. ‡Stonetile, per 1000 at plant, 4x6x8, 55.00; 4x8x8, 64.00.

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

Brookville, Penn.:		
8x10x16 in.	.25¶	.28†
8x 8x16 in.	.18¶	.23†
Camden, N. J.:		
8x8x16 in., each	.....	.16a
Lexington, Ky.:		
8x8x16 in.	.....	‡18.00*
8x8x16 in.	.....	†16.00*
Omaha, Neb. (Prices delivered):		
8x8x16 in., each	.12¶	.14‡
8x12x16 in., each	.16¶	.18‡
8x4x16 in., each	.07½¶	.09½‡
Wichita, Kan.:		
4x4x12 in., each	.....	.04½
4x8x16 in., each	.....	.07
8x8x16 in., each	.08¶	.08½†

*Price per 100 at plant. †Rock or panel face. ‡Face. ¶Plain, (a) Less 10%.

Cement Drain Tile

Longview, Wash.—Price per foot.

3-in.	.05	6-in.	.10
4-in.	.06	8-in.	.15

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Cicero, Ill.—French tile, 9x15-in., per sq.	9.50
Spanish tile, 9x15-in., per sq.	10.00
Green Spanish tile, 9x15 in., per sq., 12.00; green French tile, 9x15 in., per sq.	11.50
New York City, N. Y.—9x15 in., red, per sq., 10.00; green, per sq.	12.00

Rock Phosphate

Prices given are per ton (2240 lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Mt. Pleasant, Tenn. — B.P.L., 75%, screened machine lump, per ton, 6.25; hand mined kiln lump	4.00– 6.00
Fernandina, Fla.—B.P.L., 77%, per ton	6.50

Ground Rock
(2000 lb.)

Mt. Pleasant, Tenn.—	
Lime phosphate, B.P.L. 75%; per ton, bags extra	*12.80
Raw rock phosphate, B.P.L. 60-65%, per ton	†6.00– 9.00
Ground rock, B.P.L. 72%, per ton	4.75– 5.25

*85% thru 300 mesh.
†40-80% thru 300 mesh.

Florida Phosphate
(Raw Land Pebble)

Mulberry, Fla.—Gross ton, f.o.b. mines	
68/66% B.P.L.	3.15
70% minimum B.P.L.	3.75
72% minimum B.P.L.	4.25
75/74% B.P.L.	5.25
77/76% B.P.L.	6.25

Cement Building Tile

Lexington, Ky.:			
5x8x12, per 1000	55.00		
4x5x12, per 1000	35.00		
Longview, Wash.:			
4x6x12, per 1000	50.00		
4x8x12, per 1000	56.50		
Wichita, Kan. (Duntile) (each)			
8x8x12-in.	.08	6x6x12-in.	.06½
6x8x12-in.	.07	4x5x12-in.	.05

Concrete Brick

Prices given per 1000 brick, f.o.b. plant.

	Common	Face
Longview, Wash.	16.50	†22.50
Milwaukee, Wis.	12.50	18.00
Omaha, Neb.	15.00	.....
Rapid City, S. D.	14.00	30.00
Wichita, Kan., per 100	*8.00	*8.50

*8x8x16 size. †And higher.

Potash Feldspar

Bedford Hills, N. Y.—Color, white; analysis, K_2O, 11%; Na_2O, 2.50%; SiO_2, 68%; Fe_2O_3, 0.06%; Al_2O_3, 18.25%; pulverized, 99% thru 20 mesh; per ton, in bags, 11.45; bulk	10.25
Erwin, Tenn.—Color, white; analysis, K_2O, 10%; Na_2O, 2.25%; SiO_2, 70%; Fe_2O_3, 0.08%; Al_2O_3, 17.50%; pulverized, 100% thru 20 mesh, per ton, in bulk, 9.62; in bags	10.82
Keystone, S. D.—Color, white; analysis, K_2O, 12.75%; Na_2O, 2.25%; SiO_2, 65%; Fe_2O_3, 0.04%; Al_2O_3, 19.50%; pulverized, 99% thru 200 mesh, in bags, per ton, 17.20; bulk	16.00
Kingman, Ariz.—Color, white; analysis, K_2O, 12.50%; Na_2O, 2.25%; SiO_2, 65%; Fe_2O_3, 0.06%; Al_2O_3, 18.65%; pulverized, 98% thru 200 mesh, in bags, per ton, 19.20; bulk	18.00
Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.30%; Na_2O, 2%; SiO_2, 67%; Fe_2O_3, 0.10%; Al_2O_3, 18%; per ton, in bulk	15.00
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 2.50%; SiO_2, 69%; Fe_2O_3, 0.08%; Al_2O_3, 17.75%; pulverized, 99% thru 20 mesh; in bags, per ton, 10.70; bulk	9.50
Topsham, Me.—White; analysis, K_2O, 9%; Na_2O, 3%; SiO_2, 71%; Fe_2O_3, 0.08%; Al_2O_3, 16%; pulverized, 99% thru 200 mesh; per ton, f.o.b. Topsham; in bulk, 14.00; in bags	16.25
Trenton, N. J.—White; analysis, SiO_2, 68%; Na_2O, 2.75%; K_2O, 10%; Fe_2O_3, 0.06%; Al_2O_3, 18%, pulverized, 99% thru 200 mesh; per ton, in bulk, 19.00; in bags, per ton	20.20
West Paris, Me. — (Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.20%; Na_2O, 3.20%; SiO_2, 65.70%; Fe_2O_3, 0.09%; Al_2O_3, 19.20%; per ton, in bulk	19.00

Soda Feldspar

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 5.50%; Na_2O, 5.50%; SiO_2, 68.80%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk	18.00

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points. Bags extra and returnable for full credit.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00
Joliet, Ill.—All passing 100 mesh, f.o.b. Joliet, including cost of bags	22.00

Whiting

St. Louis, Mo., per ton	15.00*
Chicago, Ill., prices per ton.	
Domestic putty whiting	10.00–12.00
Domestic precipitated whiting	15.00–20.00
Imported bolted whiting	30.00–35.00
Philadelphia, Penn. — English chalk whiting packed in 50-lb. paper bags, per ton, in carloads	15.00

*Packed in bbl., f.o.b. St. Louis.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4-in.	6-in.	8-in.	10-in.	12-in.	15-in.	18-in.	20-in.	22-in.	24-in.	27-in.	30-in.	36-in.	42-in.	48-in.	54-in.	60-in.
Grand Rapids and Saginaw, Mich.																	
Sewer	.....	.08½	.13½	.20	.25¾	.39¾	.62½	.75	1.00	1.12½	1.62½	1.80	.....	.....	.....	.....	.....
Culvert (b)	.....	.....	.....	.55	.60	1.10	1.35	1.60e	.....	1.80	2.00	2.25	3.10	4.00	5.50	.....	.....
Longview, Wash.																	
Culvert	.....	.30	.45	.....	.55	.....	1.05	.....	.....	1.54	.....	2.70	4.00	5.00	6.00	.....	.....
Sewer	.17½	.21	.30	.42	.45	.90	1.26	.....	.....	2.16	.....	3.60	.....	.....	.....	.....	.....
Mercedes, Tex.																	
Irrigation	.....	.16	.19	.24	.29	.40c	.60	.74	.....	1.13	.....	1.77	.....	.....	.....	.....	.....
Newark, N. J.—Plain	.10	.16	.26	.36	.46	.55	.85	1.10	1.25	1.45	.....	.....	.....	.....	.....	.....	.....
Reinforced	.....	.....	.....	.....	.80	1.05	1.25	1.50	1.70	2.05	2.10	2.35	3.25	4.35	5.25	7.00	8.00

Wahoo, Neb. ..... 12-in., 15-in., 18-in., 24-in., and from 30-in. to 60-in. pipe, per ton, 10.00

(a) Reinforced. (b) To contractors. (c) 14-in. pipe; 16-in. pipe, 50c. (e) 21-in. pipe.

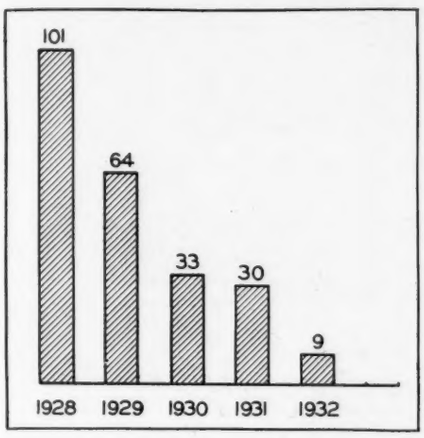
Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

City or shipping point	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard. ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
East St. Louis, Ill.—3x18-in. partition sections cast up to 13 ft. in length, 10c per surface ft.; 4x12-in. partition sections cast up to 10 ft. in length, 12c per surface ft.; 6x6-in. partition sections cast up to 10 ft. in length. 20c per surface ft.; 7x16-in. floor sections cast up to 13 ft. in length, 17c per surface ft.; precast fireproofing sections for ceilings, beams and columns are priced at 12c per surface ft.													
Grand Rapids, Mich.	.....	1.50	7.00	.....	10.00	10.00	19.50	8.00	26.00	21.00	15.00	15.00	27.00
Los Angeles, Calif. (r)	.....	.....	8.02p	.....	12.40q	.....	13.40a	.....	.....	.....	.....	.....	.....
Medicine Lodge, Kan.	.....	.....	.....	.....	.....	.....	11.50b	.....	16.00b	.....	.....	.....	.....
Port Clinton, Ohio	4.00	6.00–8.00	6.00–8.00	10.00m	10.00n	10.00n	20.00k	8.00–11.00	24.50f	26.00g	15.00h	15.00h	27.00j
Winnipeg, Man.	5.00	5.00	7.00	14.00	15.00	15.00	.....	.....	.....	.....	20.00	25.00	33.00d

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) To 14.40 per ton. (b) Includes paper bags. (c) Includes jute sacks. (d) "Gyproc," ⅜x48-in. by 5 and 10 ft. long. (f) To 27.50. (g) To 29.00. (h) To 16.00. (j) To 28.00. (k) To 23.00. (m) To 12.00. (n) To 13.00. (p) To 9.02. (q) To 14.40 per ton. (r) Plaster board, 16x48—$\frac{5}{16}$ in., per yd., 14½c; 16x48—⅜ in., per yd., 16½c.

Accidents in Cement Plants During April

THE CEMENT MILL accident record for April, as reported by the Portland Cement Association, included one fatality, two permanent partial disability accidents and six other mishaps involving loss of time to workmen. During April, 1931, there were two fatal and 28 lost-time accidents.



March accidents in cement industry

Fatal Accident—An employe of the finishing department entered the gypsum storage tunnel and barred down one of the chutes, which had become choked. He then went into the storage bin for the purpose of starting flow of gypsum from the top of the pile. Instead of standing on the edge and breaking down the center with an iron rod, he walked out on top of the pile. As he had undermined the latter when he opened the choked chute, the center of the pile caved in, suffocating him before he could be removed.

Permanent Disabilities—Packing house employe attempted to clear a blockade of cement in stock house bin screws, using a stiff wire with a loop at one end through which he had his trumb. The screw caught the wire, twisting it and taking off half of the thumb.

A master mechanic, with two helpers, were engaged in putting two lengths of screw conveyors into a new trough. The stop switch controlling the conveyor had not been locked. Contrary to the warning of his helpers, the mechanic put his foot into the trough after one length of conveyor had been attached, while he measured for the second length. At this point the conveyor switch, which carried no "hold card" or lock was thrown in by employes who could not see the men at work. Injuries necessitated amputation of master mechanic's leg below knee.

Lost-Time Accidents—An oiler fell 12 ft. when a sheet of asbestos roofing on which he was standing broke under his weight. He received a scalp wound, contusion of shoulder and burns on neck, hand and forearm, causing 2 weeks' loss of time.

An electrician had connected leads to a 440-volt motor on concrete mixer. A short circuit caused a flash resulting in burns to hands, leg, head and face, with prospective loss of 4 weeks' time.

A blacksmith at work under a dump car body which was being repaired was crushed about chest and right side when chain falls which were holding body allowed it to shift and dump. Injuries will cause several weeks' disability.

Quarry laborer threw lever of track switch on his foot, causing fractures. Loss of time undetermined.

Trackman was engaged in moving quarry track when a stone rolled against his foot, causing a small fragment to be torn loose from a bone in the foot. Loss of time about 3 weeks.

Laborer pinched fingers between track and timber used to replace derailed quarry car. Loss of several days' time.

Announce Plans for Metropolitan Cement Corp.

W. D. CLOOS, general manager of the Edison Cement Corp. of Orange, N. J., recently said that his company is busily working on a plan to make possible the operation of the plant recently purchased from Raritan township, New Jersey, and to be operated as the Metropolitan Cement Corp., a subsidiary.

General market conditions were given as the chief reason for delay in the operation of the plant. Mr. Cloos said that his company was undertaking a bond issue for this purpose, but that the market for the bonds were proving very slow.

It is unlikely that the plant will be ready for operation for several months unless the condition of the money market improves, the *Milltown* (N. J.) *Review* reports.

According to the *New Brunswick* (N. J.) *News* a payment of $95,000, representing the agreed settlement price for the delinquent taxes on the plant and property involved, and of $15,000 as advance payment on 1932 taxes has been made. This is said to complete the disposition of the plant.

Changes Name to Superior Cement Corp.

THE WELLSTON Iron Furnace Co. has been abandoned as a corporate title and the company is to be known hereafter as the Superior Cement Corp. The announcement was made by F. R. Kanengeiser who was elected president a few months ago.

The Wellston Iron Furnace Co. developed the cement plant at Superior to utilize the furnace slag from the Wellston industry.

A few months ago S. E. Stephenson and others of his family withdrew from the Wellston Iron Furnace Co., and new interests represented by F. R. Kanengeiser took control.—*Wellston* (Ohio) *Telegram.*

Another Deposit of Vermiculite in Colorado

WHAT PROMISES to be a profitable industry for Canon City, Colo., and vicinity is the development of a newly found deposit of vermiculite, at Feldspar, the *Canon City American* reports. [A deposit near Beulah, Colo., was reported in the April 9 issue of ROCK PRODUCTS.—THE EDITOR.]

Owners of the deposit, Douglas B. Christison, L. D. Christison and Clem Christison of Canon City, are now filling an order for 50 tons from an eastern firm. If tests to be conducted by the eastern company prove as satisfactory as former tests have, this deposit will prove valuable.

Discovery of this particular deposit was made about two or three months ago by Douglas Christison, while jeffrisite, a similar deposit, was found about three years ago in the same region.

The fact that the deposit is near the Denver and Rio Grande railroad will facilitate marketing the material. The Christison brothers and their father, L. D. Christison also own a large deposit of the same material of a lower grade near Cotopaxi.

Approve Standard for Diamond Core Fittings

SIGNED acceptances to the recommended revision of the commercial standard for diamond core drill fittings estimated to represent a satisfactory majority of manufacturers and users have been received by the U. S. Bureau of Standards, it announces. The commercial standard will therefore become effective for new production and clearance of existing stocks as of August 15, 1932. A printed booklet covering this standard will be issued.

Dismiss Silicosis Suits

TWO $50,000 silicosis damage suits which were filed in the La Salle county, Illinois, circuit court several weeks ago against the Ottawa Silica Co. by former employes of the concern were dismissed by Judge J. A. Davis on motion of the complainants.

A settlement is reported to have been made out of court, which resulted in the suits being dismissed.—*Ottawa* (Ill.) *Times.*

To Develop Travertine Deposit

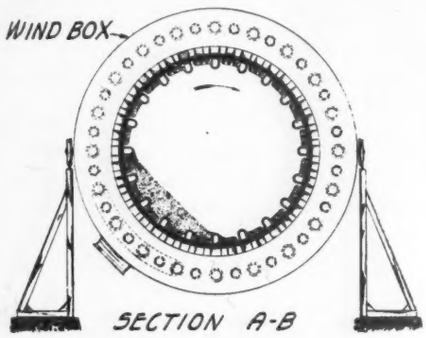
ONE OF MONTANA'S natural resources, travertine, is to be exploited by the Northern Pacific railway. A sample of this material was received in the Northern Pacific offices at Butte recently and will be on display at the Consolidated ticket office. The Northern Pacific owns a large deposit of travertine at Gardiner, which it proposes to develop.

The Gardiner deposit is said to be of a fine quality.—*Butte* (Mont.) *Standard.*

New Machinery and Equipment

Vanderwerp Recuperator for Cement Kiln

UTILIZATION OF THE HEAT of the clinker to preheat the air used for combustion is of considerable importance in the economical burning of cement clinker. This has been accomplished in part in many plants by connecting the cooler with the kiln hood in such a way



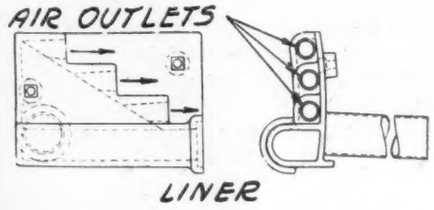
Wind box surrounds kiln shell

that the heated air from the cooler is used for combustion.

A new device known as the Vanderwerp recuperator has been developed to utilize this heat more effectively. It consists essentially of a modification of the discharge end of the kiln itself so that the clinker is cooled and the heated air utilized without a separate cooler or other external apparatus, as indicated in the accompanying illustrations.

An annular wind-box of steel plate construction surrounding the kiln shell close to the firing hood supplies the necessary air, this being furnished at a pressure of about 8-in. water gage by a fan. Blast connections from the wind-box terminate in heat-resisting metal lining plates attached to the inside of the kiln shell in place of the usual brick lining.

These plates each have three discharge orifices as shown and are bolted to the kiln shell. They are made with lugs to give a 1½-in. insulation space between the plate and the shell, and the main longitudinal air duct is raised above the rest



Discharge orifices are bolted to kiln shell

of the plate so that it acts as a lifter to spread the clinker. The last row of plates at the discharge end has a flange to retard the flow of clinker and keep it longer in the cooling zone.

The wind-box does not rotate with the kiln but is carried on structural supports arranged to allow it to move longitudinally to compensate for kiln expansion and has a flexible connection with the main air line. A concentric ring carrying the blast connections is attached to the kiln and makes sliding contact with a plate on the wind-box, this contact being maintained by the inside air pressure and by a counterweight on each side of the kiln.

By means of an inside diaphragm and ports, air is admitted to the blast plates under the clinker and a small amount of cooling air is also admitted intermittently around the entire periphery.

Test Results

A recuperator of this type was recently installed on an 8½-ft. by 10-ft. by 153-ft. dry-process coal-fired kiln in which the raw material is a mixture of 60% limestone and 40% slag.

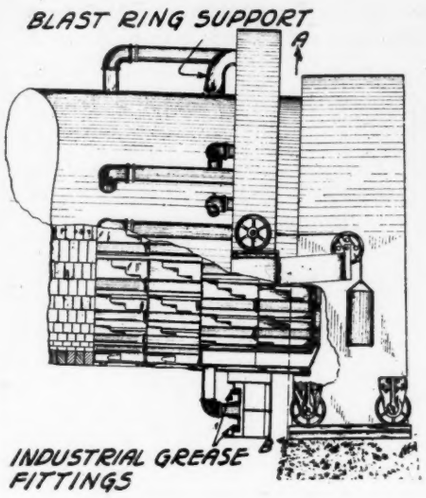
Four rows of plates were used, covering a length of 8 ft. at the end of the kiln. Each row consisted of 20 plates to the circle and each plate was 2 ft. long. The first row in contact with the hottest clinker was of No. 20 Pyrasteel capable of withstanding 2000 deg. F. continuously, and the remaining rows were of a special iron mixture. Slag and Lumnite cement were used for insulating, rammed in moist.

The recuperator was furnished by the Manitowoc Engineering Works, Manitowoc, Wis., the Pyrasteel by the Chicago Steel Foundry Co., and the iron plates by the Lakeside Malleable Castings Co.

It was arranged to blow all the secondary air through the plates, and in order to have a maximum of this the primary air was reduced to about 20% of the total. The waste gases were drawn through a waste-heat boiler and economizer and it was found that the draft could be considerably reduced because of the air supply pressure.

Tests conducted by the cement company indicated a fuel saving of 15 to 20% and an increase in output of 5%. Waste heat boiler evaporation was increased about 10%, probably due to less cold air infiltration with the lower draft and less dust deposit on the tubes.

A higher flame temperature was maintained, which accelerated clinker burning and more than compensated for the 8-ft. reduction in kiln length. The heat transfer from the clinker to the combustion air represented about one-half of the coal saving, the balance of the heat recovery being ascribed to the higher combustion temperature. The secondary air was heated to a temperature of 1000 to 1300 deg. F.



Wind box moves with kiln

The final temperature of the clinker discharged from the kiln was 1400 deg. F. as compared with 2400 deg. F. normally. The clinker showed easier grindability, probably due to the shrinkage stresses set up by more rapid cooling, and the early strength tests of the cement were improved. No deterioration was noted in the lining plates, which remained practically black at all times.

This method can of course be used in connection with the usual rotary coolers, allowing them to complete the cooling.

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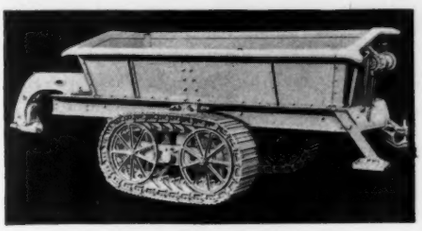
Grants Manufacturing Rights

THE AMERICAN CABLE CO., New York, N. Y., announces that the Wickwire Spencer Steel Corp. has recently been added to the list of wire rope manufacturers licensed to manufacture preformed wire rope under the American Cable Co.'s patents.

Other companies in the United States who are licensed to make preformed wire rope are: American Steel and Wire, Broderick and Bascom Co., E. H. Edwards Co., Hazard Wire Rope Co., Macwhyte Co., Pacific Wire Rope Co., General Cable Corp., and the Wire Rope Manufacturing and Equipment Co.

Bottom-Dump Trailers

ANNOUNCEMENT is made of the "Forged-Trak" bottom-dump trailer—a new crawler wagon made by the Athey Truss Wheel Co., Chicago, Ill. Features claimed for this new trailer are: One-piece box section arch drawbar, with adjustable and reversible spring mounted, spring cushioned swivel type tractor hitch; track assembly has interlocking self-cleaning structure; track pin bearing is of the pin and bushing type; track pin is heat-treated alloy steel; and the link is made to form a seal against entrance of foreign matter.



Made in four sizes

This trailer is made in four sizes, with 5-, 6-, 7- and 8-cu. yd. capacities. Extension sides are furnished on the 6- and 8-yd. units. The body is said to be self-cleaning.

The dump mechanism is hand operated and the cable drum shaft is mounted on Hyatt roller bearings. A spring mounted equalizer sheave is said to minimize shock on the cable.

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Anti-Friction Conveyor Carrier

A NEW anti-friction conveyor carrier has just been announced by the Barber-Greene Co., Aurora, Ill.

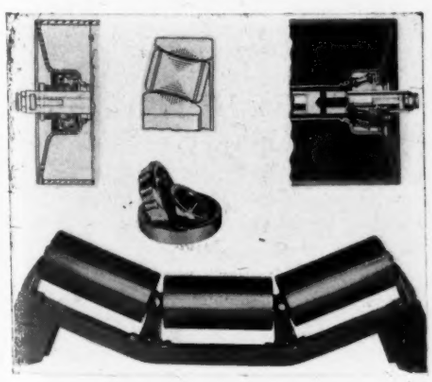
The Shafer roller bearings are of an exclusive design and principle, being self-aligning, and taking thrust as well as radial load, the manufacturer states.

Each size of carrier has but one size roller unit, making these units and component parts interchangeable. The Barber-Greene carrier is made to interchange with any standard carriers for making replacements.

The roller is made of 5½-in. dia. seamless tubing No. 9 gage metal. Ends are made of pressed steel with the outer roller race inserted under pressure. The inner tube is 1⅜-in. in dia. with two shoulders, one at each of the ends.

The spindle is ¾-in. in dia. made of cold rolled steel drilled and tapped on each end for grease and Alemite, slotted to fit in the end brackets, and provided with two flats to lock the grease-seal washers.

The load rating of each roller bearing is 450 lb. Each roller is supported by two pressed steel brackets which are bolted to a channel base.



Bearings take thrust and radial load

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Welding Equipment Prices Reduced

THE LINDE Air Products Co., New York, N. Y., announces that substantial reductions in the prices of Oxweld welding and cutting blowpipes are now in effect.

One of the major items of apparatus affected by this change is the Oxweld type W-17 welding blowpipe, a low pressure injector type of blowpipe.

Along with other price reductions in Oxweld blowpipes, the Oxweld type C-14 cutting blowpipe is being offered at a new low price.

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Line of Materials Handling Equipment Added

THE Osborn Manufacturing Co., Cleveland, Ohio, announces the addition of a complete line of overhead materials handling equipment to be known as Osborn Tramrail Systems.

They have been designed to meet practically every condition encountered and there are several exclusive features of design in the equipment for safe and quick overhead transportation of materials, according to the manufacturer. The equipment is built for capacities up to three tons.

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Announces 1½-Yd. Truck Mixer

THE NEW REX 1½-yd. Moto-Mixer (2-yd. agitator) is announced as a new size, but not a new machine, by the Chain Belt Co., Milwaukee, Wis. Its design, construction and features are patterned closely from other members of the Rex Moto-Mixer line.

When used as an agitating unit, this mixer fits into the wet plant employing a 2-yd., 56-S plant mixer, handling one batch to a load. As a 1½-yd. truck mixer, this unit answers the growing demand of small plants for a light, low cost machine that can be mounted upon a small inexpensive truck chassis.

The drum of the standard design with conical front section is mounted with three-point suspension—a special SKF ball thrust bearing carrying the forward end and two Timken mounted rollers supporting the rear. In addition, by shortening the diameter of the rear drum track, the entire drum is swung between the body sills to establish a low center of gravity.

Mixing water is measured by means of a calibrated overflow pipe, extending into the mixing water compartment. The tank has two compartments, one for mixing water, the other for washout water, both equipped with calibrated sight gages.

The distributing spout is of the Rex one-man type. It is fastened by two hinges in such a manner that one man can quickly swing it from the cradle, in which it rides when the truck is traveling, into discharging position.

This new mixer can be had equipped with the Rex-Heil "Jackass" hoist which the manufacturers claim doubles effective spouting area and permits discharging directly into a 3-yd. storage hopper without using a ramp.

The drum is driven by an independent motor equipped with electric starter which operates from the truck's battery. All controls are located at the rear of the drum.

Low center of gravity and accurate water control

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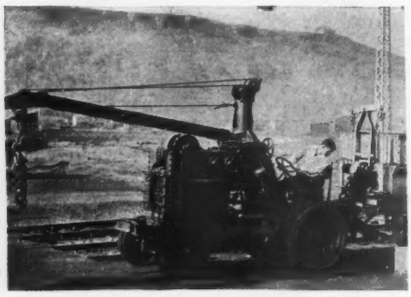
Nonmetallic Switch Hook Promotes Safety

A NEW SWITCH HOOK that promotes safety in station operation has been announced by the General Electric Co., Schenectady, N. Y. This hook is composed of insulating material, and gives maximum protection against accidental contact, the manufacturer states.

Inasmuch as the present trend in the design of switching equipment is towards reduction in space, this new switch hook should be appealing to the operator, minimizing as it does the possibility of accidental contact between live parts of adjacent switches or between live parts and framework.

Improved Crane Unit Offered with Choice of Power

ANNOUNCEMENT has just been made that the Loadmaster, manufactured by Bucyrus-Erie Co. of South Milwaukee, Wis., will now be available with either Case



Portable crane finds many jobs

or McCormick-Deering power, and that the capacity of this crane has been further increased to 4500 lb.

With its increased capacity, this Loadmaster can be used as a stationary revolving-boom crane, as a crane traveling with its load, or as a tractor.

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Produces Small Series of Heavy Duty Engines

THE Hercules Motors Corp., Canton, Ohio, announces the IX series of engines and power units, thus giving a complete range of sizes of from 9 to 175 hp.

Model	Bore	Stroke	Displacement
IXA	3	4	113.1
IXB	3¼	4	132.7

The two models are identical in general design and the majority of the parts are inter-changeable, the only difference being in the bore sizes and the parts affected thereby.

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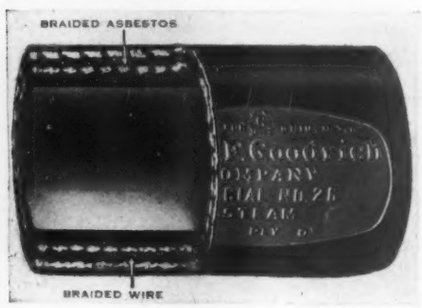
Steam Hose

A NEW DEVELOPMENT in steam hose is announced by the B. F. Goodrich Rubber Co., Akron, Ohio. The hose is made in sizes of from ½ to 2½ in. The insertion of this hose consists of braided asbestos, combined with wire. Tests indicate it can be safely used for pressures up to 200 lb., the manufacturer states.



Insertion of asbestos and wire

Pneumatic Feed for Rock Drills

A NEW TYPE of feed and mounting for rock drills which, it is claimed, increases the speed and reduces the cost of line drilling or channeling where it is necessary to remove quarry blocks or to establish new faces without the waste caused by blasting, is announced by the Sullivan Machinery Co., Chicago, Ill.

This device is said to be an entirely new twin-cylinder pneumatic feed on which a Sullivan hammer drill is mounted permanently. It is claimed to have the following advantages: Provides greater handling convenience; permits automatic feed regulation; secures long range of feed without changing steel; eliminates feed screw and hand cranking; permits either drilling or broaching steel to be used with minimum front head changes; broaching steel requires no shanking; low piston wear and general upkeep expense; adaptability to varying rock conditions; single throttle control of both drill and feed; and alignment of drill steel in hole maintained by special steel guide.

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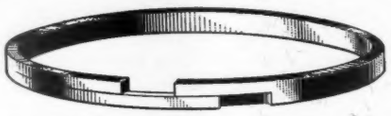
Piston Ring

A NEW one-piece piston ring claimed to have the same sealing effect as its two-piece ring is announced by the Double Seal Ring Co., Fort Worth, Tex.



One-piece ring with two-piece features

The new ring is claimed to prevent blow-by in worn cylinders. The design of the ring is such that at the gap and for considerable distance on each side of this gap the construction is almost identical with the two-piece ring, having the same fundamental principles of sealing against leakage. Features claimed for the new ring are simplicity, economy as to first cost, and satisfactory sealing of the cylinder against loss of compression in worn and new cylinders.

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Ball Bearings

ANNOUNCEMENT is made by the Standard Steel and Bearings, Inc., Plainville, Conn., that it has acquired patent rights to an oil retention device for ball bearings. The oil retainer, or seal, is composed of two circular plates wedged together into a groove in the outer ring of the bearing. Between these two plates is a wiper, or ring of felt, that makes contact with the inner ring of the bearing. This is said to form a dam that retains the lubricant.

Pressure on the felt ring is said to improve the sealing contact and to take up the wiper wear as it develops.

Vibrating Screen Handles Cement Clinker

AN INTERESTING TEST in which the performance of a Mitchell electric vibrating screen handling cement clinker at a cement plant was checked is reported by the Gifford-Wood Co., Hudson, N. Y. The test resulted from an investigation to find the most efficient method of increasing cement quality without decreasing production of the present equipment.

The method adopted was to install screens operating in closed circuit with the preliminary mills. With this installation a uniform sized feed, all of which passed the 30-mesh screen, was delivered to the tube mills. The report states the production of the tube mills was maintained and the amount of finished product passing the 200-mesh screen was considerably increased. All material not passing the 30-mesh screen, in the outside screening operation, is returned to the preliminary mills for further reduction. Temperature of the clinker at this point ranges from 250 to 300 deg. F. and at times contains sufficient moisture to steam readily, the report states.

The report explains in detail tests which were made on the comparative efficiency of two makes of vibrating screens in this work. These tests were to determine the amount of fines remaining in the oversize, the amount of product retained on the 100-mesh in the feed to the tube mills, and mill output and its effect on the screening action of the various screens. Complete data on these tests is contained in the report.

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Link-Belt Takes Over Subsidiary

LINK-BELT CO., Chicago, Ill., has acquired the plant of H. W. Caldwell and Son Co., which has been made an integral part of Link-Belt. In 1921 Caldwell and Son became a subsidiary of the company. Recently the George W. Moore Co. was purchased and its business consolidated with that of Caldwell. At that time it was decided to turn the whole unit over directly to Link-Belt Co.—*Chicago* (Ill.) *Journal of Commerce.*

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Blast Hole Drill

THE Loomis "Clipper" blast hole drill is manufactured by the Loomis Machine Co., Tiffin, Ohio. This drill has crawlers operated by friction clutches, the machine is on a low frame, it is driven by heat-treated chains, and is equipped with a metal band wheel of small diameter and with multiple V belt drive.

The manufacturer states the machine will climb a steep grade and that it can be turned almost within its own length.

Recent Prices Bid and Contracts Awarded

LaSalle, Ill. Two contracts for furnishing gravel for two road contracts in Knox county were recently awarded. The bids do not include the cost of spreading. On a job at Altona the Western Sand and Gravel Co. was low at $1.65 per ton and for a job at Henderson at $1.68. On another job O. T. Miles was low with a bid of $1.72 per ton, spread, for 7119 tons.

Santa Fe, N. Mex. Dudley Stone Products Co., El Paso, was low bidder on a highway project at Roswell. The bid was 59c. per cu. yd. for 9200 yd. of crushed rock.

Gary, Ind. Only one bid, $10 per ton, was received by the local board of public works on its requirements of 500 tons of rock asphalt.

Lincoln, Neb. Contract for furnishing and placing 1471 cu. yd. of gravel on state road near Blair was recently awarded the Abel Construction Co. at $1.39 per cu. yd.

Eau Claire, Wis. Low bid for furnishing crushed stone surfacing on state roads near here was made by August Schroeder of Milwaukee. The bid was $1 per cu. yd.

Valparaiso, Ind. County commissioners have awarded approximately two-thirds of the county crushed stone requirements to the Henderlong Lumber Co. at $1.36 per ton and the remainder to the Moulding-Brownell Corp. of Chicago for $1.64. The first contract is based on rail haul and the latter on truck delivery.

New York State Crushed Stone Men More Optimistic

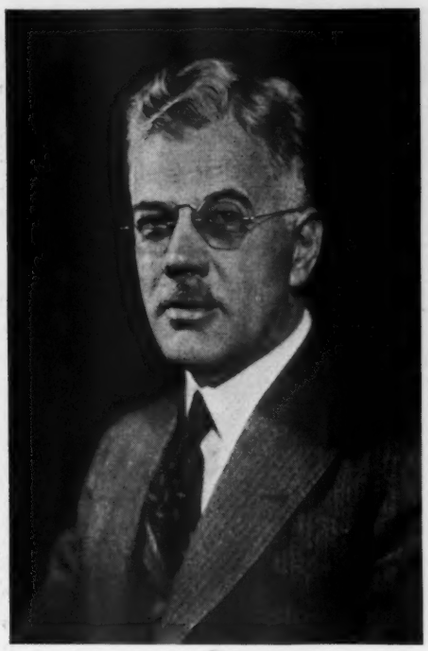
SOME 12 or 13 crushed stone producers, members of the New York State Crushed Stone Association, attended the regular monthly meeting of the association in Syracuse, May 26. The general sentiment of the group was more optimistic than it has been for some time, due to a feeling of certainty that some sort of Federal public works program would materialize. They also believed that they, along with other highway construction interests, would be successful in compelling the state of New York to use the gasoline tax and motor vehicle license fees for highway work, for which they were intended.

A number of the producers also attended a meeting on the same day of the New York State Construction Council, composed of manufacturers of highway materials and contractors, which has employed a salaried secretary and started to organize specifically to combat the diversion of gasoline tax and motor vehicle license fees in New York state.

The organization has already started court proceedings in Albany, N. Y., in an attempt to obtain an injunction against the diversion of the $32,000,000 taken recently from the state highway fund for the purpose of direct relief for unemployment. It is believed that these efforts will meet with success.

S. F. Beatty Elected President of Austin Manufacturing Co.

AUSTIN Manufacturing Co., of Chicago, Ill., announces the election as its president of S. F. Beatty, who is known to the road builders of this country through his activities as president of the Austin-Western Road Machinery Co.



S. F. Beatty

and of the Road Machinery Manufacturers' Association, as well as through his many years of service as officer and director of the American Road Builders' Association.

W. T. Beatty, for many years president and general manager of the Austin Manufacturing Co., has been elected chairman of the board, while K. N. Forbes has been elected vice-president.

Sewell S. Avery Favors General Sales Tax

AFTER a long discussion of general business conditions with President Hoover, Sewell S. Avery, president of the United States Gypsum Co., Chicago, Ill., stated that the almost single suggested thing that would quickly afford relief and confidence would be enactment of a sales tax.

Mr. Avery, who conferred more than an hour with the President, also stressed the necessity of balancing the budget.

He thought the statement of Owen D. Young, urging $2,000,000,000 construction program, through self-liquidating enterprises, was "an excellent one."

Measures already taken by the government, he said, have been of tremendous benefit and will do even more in the future.—*Wall Street Journal* (New York City).

Gifford-Hill Starts Quarry at Bull Lake, Tex.

GIFFORD-HILL AND CO., INC., Dallas, Tex., has leased a rock quarry near Bull Lake, Tex., on which it has installed a crusher with capacity of 250 cu. yd. per day from which it will supply crushed stone on a contract recently signed by Cooke and Braden, contractors, for 9000 yd. According to reports, tests made by the state university and highway department indicate the quality of this deposit exceeds all requirements for the work.

L. P. Lively is superintendent in charge of the work and F. M. Smith is foreman.

New Sand and Gravel Producer in Iowa

THE STAR COAL and Improvement Co., Davenport, Ia., is to enter the sand and gravel producing business from Mississippi river materials. In an amendment to articles of incorporation the firm is authorized to own or lease and to build and operate the necessary barges, power boats and machinery incident to the transaction of a general business in the sand and gravel field. B. H. Kelley is president and P. L. Kernan, secretary of the firm.

H. M. Davison Makes Change

H. M. DAVISON, who has been excavator sales manager of the Harnischfeger Sales Corp., Milwaukee, Wis., has left that organization. Mr. Davison is now in the East completing plans in connection with a new organization, information concerning which will be issued shortly.

"Davy," as Mr. Davison is known to a host of friends, has been active in both the National Crushed Stone and the Sand and Gravel associations, serving as chairman of the manufacturers' division and member of the board of directors of both organizations.

Completes New Gravel Plant

GRAVEL PITS west of Hollis, Ill., are being developed by the Kingston Lakes Gravel Co., a new concern located there. It is said to have invested $150,000 in its new plant and is soon to open offices in Peoria.

A switching rate of $8.10 per car on sand and gravel from the new plant to Peoria has been requested by the T. P. & W. railroad, the *Peoria Star* reports.

Starts Trial in Silicosis Suit

THE $25,000 damage suit of Russel Keller against the International Silica Co., Cairo, Ill., was started in circuit court before Judge A. E. Somers on May 16.

Keller alleges that he is suffering from silicosis as the result of working at the company's plant at Elco.—*Cairo* (Ill.) *Citizen.*

News of All the Industry

Incorporations

R. E. Janes Gravel Co., Austin, Tex., $10,000. R. E. Janes and C. W. Janes.

Charles Black Sand and Gravel Co., Hammond, La., $10,000.

XL Concrete Company, Inc., Phoenix, Ariz., $30,000. Thomas Schuster and Samuel Y. Mayes, 426 South Sixteenth ave., Phoenix.

Lake Geneva Sand and Gravel Co., Lake Geneva, Wis., $20,000 or 200 shares at $100 each. C. D. Stevenson, W. L. Seymour, and A. G. Thorson. To deal in sand and gravel.

The Dakota Quartzite Co., Sioux Falls, S. D., $25,000. H. J. Gallagher, E. R. Gallagher and J. C. Parliman, all of Sioux Falls. To engage in quarrying.

Hildebrand Cement Burial Vault Co., Davenport, Ia., $10,000. President, C. M. Bell, Muscatine, Ia.; vice-president, E. F. Hildebrand, Davenport, Ia.; secretary and treasurer, H. F. Hildebrand. To produce concrete products.

North Middlesex Washed Sand and Gravel Co., Inc., Groton, Mass., $10,000, or 100 shares at $100 each. President, Marion K. Pierce; treasurer, George H. Pierce; and Adelard A. Roy.

City Sand and Gravel Co., Inc., Fitchburg, Mass., $15,000, or 150 shares at $100 each. President and treasurer, Alfred Ouellette, 158 Boutelle st., Fitchburg; Viola Ouellette and Onesime Ouellette.

Acme Sand and Gravel Co., Shreveport, La., $5,000, divided into 200 shares of stock. J. E. Juban, Shreveport; C. M. Brough, Yazoo City, Miss.; J. F. Jones and Nina V. Jones, Vicksburg, Miss.

Quarries

Glasgow, Ky. The state crusher is operating in this vicinity and has completed crushing limestone on a number of farms here.

San Pedro, Calif. The city will use rock from its own quarries on Catalina Island in construction of the rip-rap mole and jetty at Fish Harbor.

National Lime and Stone Co., Findlay, Ohio, has been operating its plant at Lewisburg 11 hours per day.

W. J. Thompson of Whittier, Calif., who asked permission to operate a rock crushing plant in the San Garbriel Wash, has been denied permission.

Walter Huysman suffered fire loss at his quarry near Ottoville, Ohio, May 19. Fire is believed to have been of incendiary origin. The damage will be repaired at once.

Burlington, Ia. A committee on unemployment here will ask the city council to establish a stone-crushing plant to supply stone for surfacing dirt streets.

Florida Trap Rock Products Co., Zephyrhills, Fla., is reported to have clear title to its holdings there and is now installing a second crusher in its plant.

The Weir quarry near McGregor, Ia., has been opened and about 7000 cu. yd. of rock will be quarried for rip-rap and dam work at Lynxville, Wis.

Chris Schmohl and Leo Hopla, Arco, Ida., have contracted with the Utah-Idaho Sugar Co. to supply 500 tons of limestone from the Arco quarry. This quarry has been inactive for several years.

Elmore Stone Supplies has leased the stone quarry at Limestone, Ohio, which has been idle for about four years. The company will furnish crushed stone for Weis Bros. and Burmann, who control the company, as well as the local market.

Madison, Wis. A resolution asking the city to reopen the old stone quarry near Sunset Point has been filed with the city clerk. The quarry was abandoned some years ago when it was found the stone was too soft for paving purposes, the *Madison Times* reports.

Dresser Sand Co., Leavenworth, Kan., has been awarded contract for 4000 cu. yd. of crushed stone and has opened an old rock quarry which it will operate to supply this contract. Two crushers are being installed and the company expects to produce 600 cu. yd. of stone per day, working three eight-hour shifts.

Sand and Gravel

Southwest Sand and Gravel Co., Dodge City, Kan., has completed installation of its portable sand dredge on the Arkansas River, near Ford.

Brillion, Wis. The city crushing plant has been moved from the Haise gravel pit to its new location on property of Mrs. George Schnell.

Clarksville, Ohio. A gravel pit is being opened here on the old Quaker church property. Wm. Greathouse bought the property sometime ago.

Cox and Rich, Cassville, Mo., have installed their crusher near Seligman and will start operating soon.

Casco Gravel Co., with plant near Luxemburg, Wis., was recently bombed. A charge of dynamite had been placed in a storage bin and was set off with a fuse. The company could offer no cause for this vandalism.

Geo. Collins of Leavenworth county, Kan., submitted low bid for Kaw river sand and gravel on highway work near Bonner Springs recently. He said that if the contract were awarded him a new sand and gravel plant would be opened on the Kaw river near Linwood.

Morrill, Kan. A gravel pit is being opened on the John Kaufman place near here. The gravel will be used for road surfacing. A second pit is expected to be opened on the Charles Showalter farm to obtain a finer gravel to use with the coarser gravel from the Kaufman pit.

Cement

Dewey Portland Cement Co. was recently granted clear and undisputed title to the tract of land on which its plant near Buffalo, Ia., is located.

Pennsylvania-Dixie Cement Co. plans to close its plant at Portland Point, N. Y., as a result of the drastic reduction in New York state highway construction. Shipments of cement will be made from stock.

Moscow, U. S. R. R. The Russian government has authorized erection of a new cement plant in the Orsk district to cost about $5,750,000 with equipment. Amtorg Trading Corp., New York City, is the official buying agency.

Chicago, Ill. Cement plants to resume operation recently include: Fredonia, Kan., plant of the Consolidated Cement Corp.; the Ironton, Ohio, plant of the Alpha Portland Cement Co.; the Northwestern States Portland Cement Co.; the York plant of the Medusa Portland Cement Co.; the Olympic Portland Cement Co.; Diamond Portland Cement Co.; the Richard City plant of the Pennsylvania-Dixie Cement Corp.; and the Monolith Portland Midwest Co.

Gypsum

Staten Island, N. Y. The *Gypsum Empress* will sail weekly for Windsor, Canada, after having been in dock since December 20. She will leave for her trips from the U. S. Gypsum docks.

Lime

Alabaster Stone Co., Siluria, Ala., is building two lime kilns at Scotrock in Shelby county. Geo. Scott is the manager.

Coos Bay Lime Association near Coquille, Ore., has installed crushing equipment and will supply ground shell to farmers for agricultural purposes.

Cement Products

Grohne Concrete Products Co., Decatur, Ill., recently lost its plant by fire.

Raymond Slaton, Sedalia, Mo., plans to open a ready mixed concrete and a tile plant on highway 65 there.

Thomas Donley and Sons, Yellow Springs, Ohio, have commenced erection of a cement block factory.

Concrete Products of Norfolk, Va., is opening a concrete pipe plant at Dover, N. J. From 12 to 20 employes will be required to operate the plant.

W. P. Hews of the Yakima Cement Products Co. is equipping a second plant at Wenatchee to be known as the Columbia Concrete Pipe Co. A. B. Metcalf, who has been with the Yakima plant for three years, will be manager of the Wenatchee plant. Irrigation, culvert and sewer pipe will be manufactured.

Miscellaneous Rock Products

Asphalt Products Corp. has sold its plant at Cape Girardeau, Mo., to the Missouri Amiesite Co.

Philip S. Hoyt, Franklin, N. C., is interested in developing kyanite deposits near there and contemplates erecting a mill.

Colorado Springs, Colo. The Colorado Society of Engineers is advocating the use of Colorado's marble deposits, claiming to have denosits of both black and white marble of high quality.

Andrews, N. C. Prospecting for marble under the direction of D. H. Tillitt has disclosed marble of excellent quality in practically unlimited quantity. Samples of both white and blue marble have been found.

Alliance, Neb. The western Nebraska potash field will soon be worked again. A syndicate has leased a plant here and will produce fertilizer, salts and related products under the supervision of John Burns, of Kansas City. The plant has been inactive for 15 years.

Independent Construction Co., Ltd., Oakland, Calif., has completed an asphaltic mixing plant near the Bechtel-Kaiser Rock Co.'s plant. Crushed rock will be obtained from the Bechtel-Kaiser plant and local river sand will be used in the production.

Personals

F. F. Reath of the Northwestern Portland Cement Co. has been named superintendent of its Grotto plant.

Winslow Sampson, for many years associated with S.K.F. Industries, has been appointed Pittsburgh manager of the Kron Co. The Pittsburgh offices will be located at 302 Penn Ave.

Murphy, N. C. J. T. Singewald, Jr., professor of economic geology of John Hopkins University, and a party of 10 graduate students, have been visiting various nonmetallic mineral plants in this area recently.

T. R. Barnum, superintendent of the Berea Quarries Co., Berea, Ohio, since 1916, has resigned. He has been associated with this company and its predecessor, the Cleveland Stone Co., for over 45 years.

Dr. and Mrs. Ernst Egon Pralle, engineer, Lime and Portland Cement Works, Grob-Hartmannsdorf, Germany, are spending several weeks in the United States. During their stay they will visit a number of lime plants.

George L. Hurst, consulting mechanical engineer of San Francisco, is now handling the sale of the Farrel-Sykes line of gears, speed reducers, gear drives and gear-cutting machines and related machinery in this territory.

J. R. Brown, Akron, Ohio, has been appointed sales representative of the Farrel-Birmingham Co., Inc., Ansonia, Conn., to handle the sale of the Rafter patent press-brake and other types of mechanical and hydraulic metal working presses in the middle west territory.

Obituaries

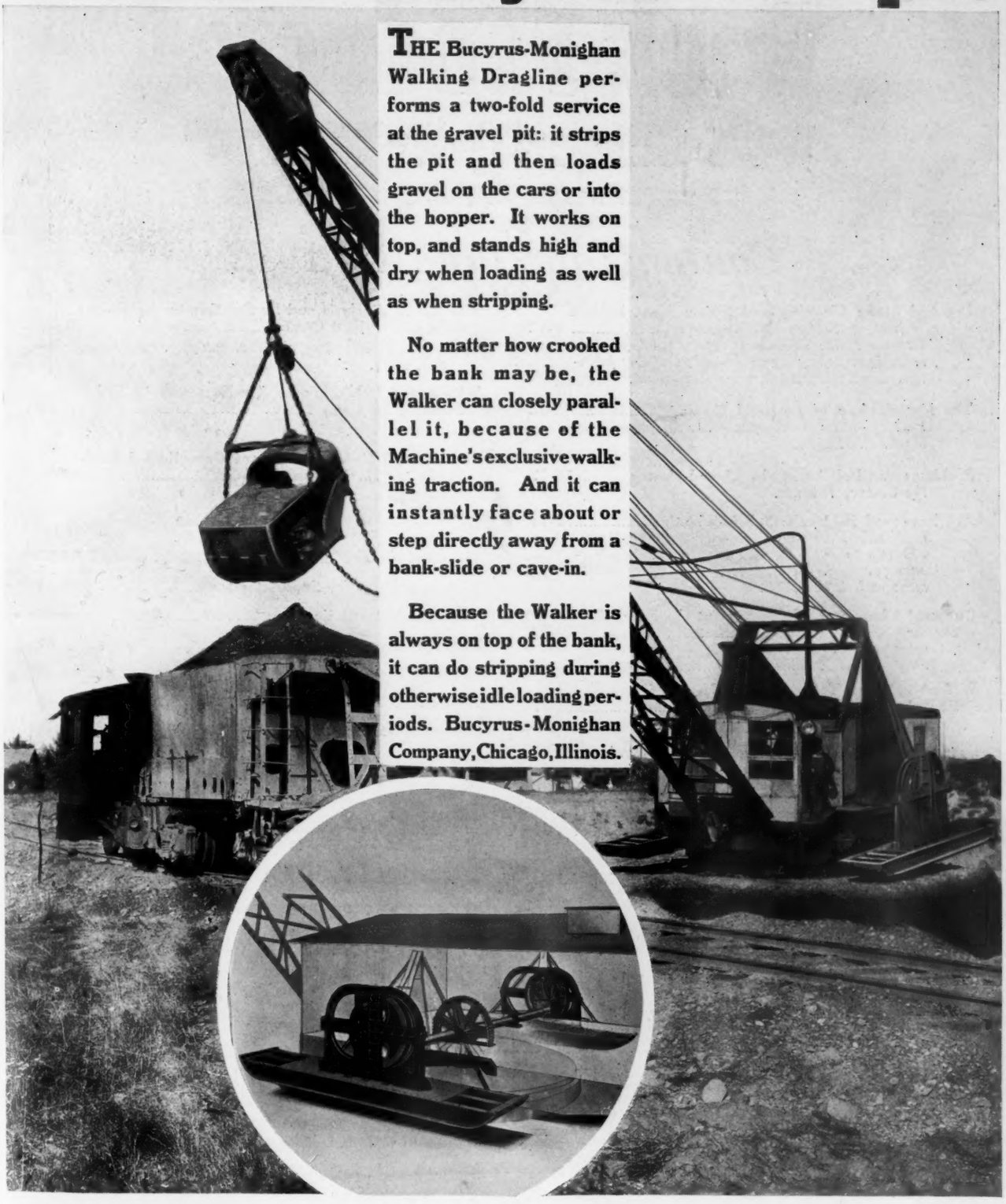
George H. Lawrence, 83, who was superintendent of quarries for the Dominion Iron and Steel Co., Ltd., for many years, died recently at Montreal.

Manufacturers

Charles M. Sloan has moved his advertising offices to the Straus Building, Chicago, Ill.

T. H. Edelblute Co. announces its general office

Double duty at the pit



THE Bucyrus-Monighan Walking Dragline performs a two-fold service at the gravel pit: it strips the pit and then loads gravel on the cars or into the hopper. It works on top, and stands high and dry when loading as well as when stripping.

No matter how crooked the bank may be, the Walker can closely parallel it, because of the Machine's exclusive walking traction. And it can instantly face about or step directly away from a bank-slide or cave-in.

Because the Walker is always on top of the bank, it can do stripping during otherwise idle loading periods. Bucyrus-Monighan Company, Chicago, Illinois.

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Walking Draglines 1 to 10 cubic yards

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Rock Products

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Rock Products
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Volume XXXV Chicago, June 18, 1932 Number 12

Crushed Stone Cleaning and Sizing Plant Rebuilt for Vibrating Screens Throughout

Genesee Stone Products Corp., Batavia, N. Y., Rebuilds Screening Plant and Adds Washing Facilities, Using Vibrating Screens Throughout

Looking toward plant from primary crusher

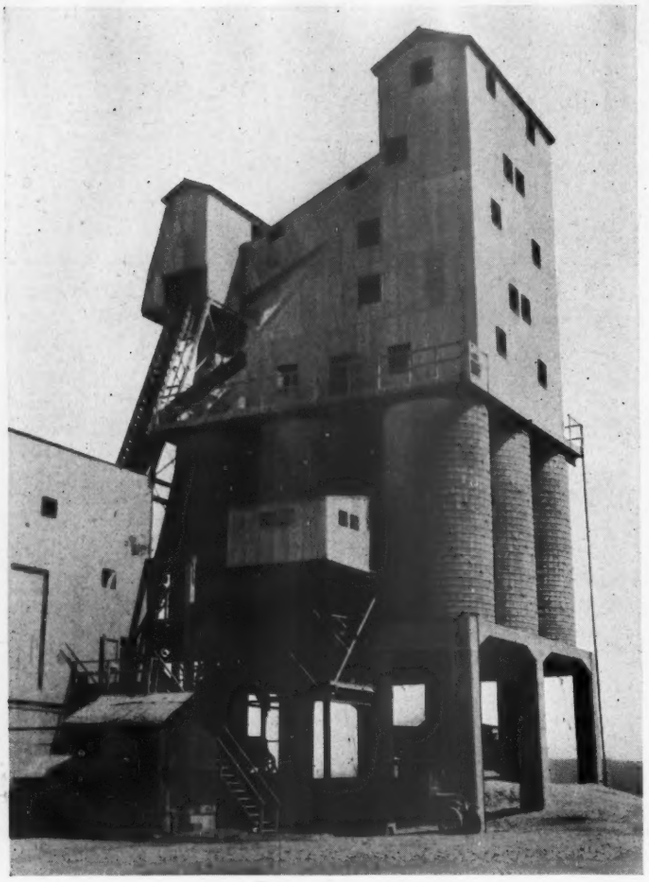
FOLLOWING changes to its recrushing and scalping plant a little over a year ago, the Genesee Stone Products Corp., with a plant at Stafford, a few miles east of Batavia, N. Y., has just completed the rebuilding of its loading bins and screening plant. Arrangements have also been made so that any sizes of stone may be washed over a vibrating screen before loading. These changes have resulted in improved operation with a productive capacity of 1500 to 2000 tons of crushed stone per day.

A total of nine vibrating screens are used for sizing and washing, and three secondary crushers are available for the reduction of the coarse material. Dump trucks are used to transport the rock from the quarry to the crusher.

Quarrying

The limestone deposit, which is covered with about 1½ ft. of overburden, is at present being quarried to a depth of 40 ft. The face is worked in one cut.

Primary drilling is done with two Loomis electrically operated well drilling machines, which make 6-in. holes. This drilling is done at the rate of about 40 ft. per day per machine and the holes are drilled to a depth of about 4 ft. below the quarry floor. They are spaced 20 ft. back from the face and 15 ft.



General view of plant and silos

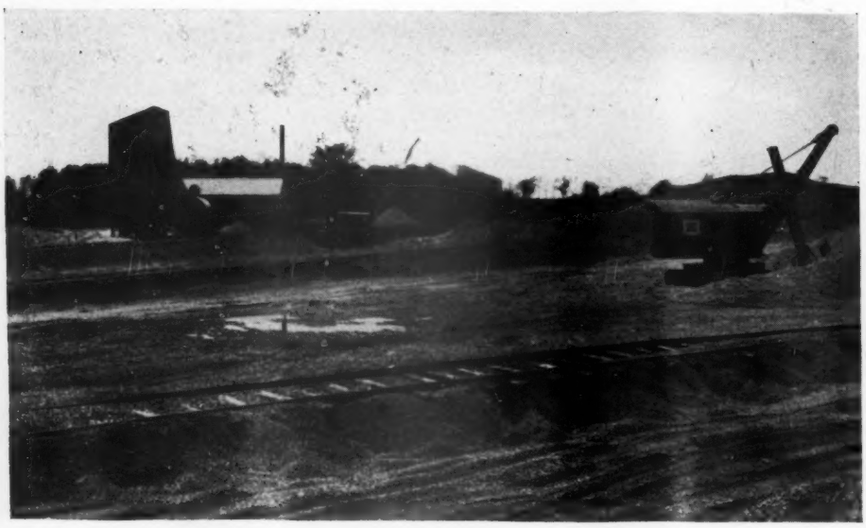
apart and are staggered. From 75 to 125 holes, in two or three rows, are shot at one time. Each hole is loaded with about 300 lb. of dynamite, one-half 40% and one-half 60% strength.

Two 2½-yd. Marion steam shovels, one mounted on crawler treads and one on traction wheels, are used for excavating and loading. Five Brockway motor trucks are used to transport the rock from the shovels to the primary crusher. These trucks are equipped with side dump bodies and haul about 8 tons of rock. The hauling distance is approximately 1000 ft. The truck bodies are dumped at the crusher by a 6-ton Chisholm and Moore electric hoist movable on a trolley beam and steel frame above the crusher.

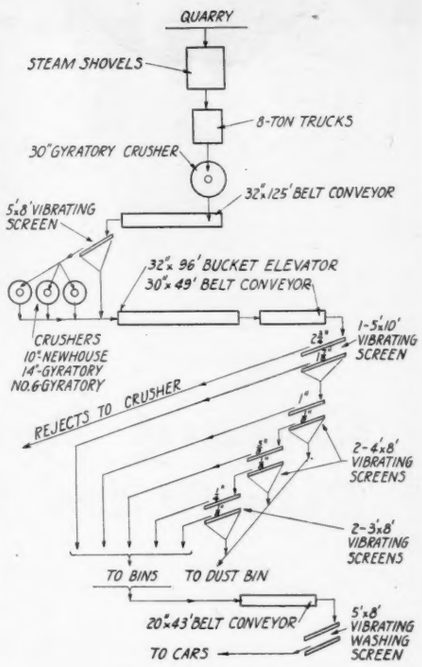
Crushing and Scalping

Primary crushing is done in a 30-in. Traylor "Bulldog" gyratory crusher so located that the trucks are dumped into it from ground level. The material discharged from the primary crusher is carried by a 32-in. inclined belt conveyor, 125 ft. long on centers, to a 5- by 8-ft. single-deck Niagara vibrating scheen. Here the oversize is scalped out to the recrushers and the throughs from the screen along with the material from the recrushers is discharged to a bucket elevator carrying up to the screen house.

One 10-in. Newhouse crusher, one 14-in. McCully gyratory crusher and one No. 6 Kennedy gearless gyratory crusher are used as needed for recrushing. The various units are driven by individual motors, mostly General Electric, as indicated in the accompanying table. V-belt drives and Morse silent-chain drives are largely used.



Adjoining road material plant and storage yards



Flow sheet of plant

Screening

From the recrushing department, the material is carried up in a 32-in. belt bucket elevator (96 ft. long on centers) to a 30-in. by 49-ft. inclined belt conveyor which discharges to the first of a series of seven Niagara vibrating screens. These screens, which are used for sizing the material, are all double deck and are located at four different levels above the loading bins.

The first is a 5- by 10-ft. screen from which any oversize from the top deck is spouted back to the recrushers. The material passing over the lower deck is spouted to the bins as one size, while the material passing through this deck is divided to two parallel 4- by 8-ft. screens located on the floor below.

These screens are followed by another set of two 4- by 8-ft. screens on the next floor below and those again by a set of two 3- by 8-ft. screens on the next floor. Each of these three sets of screens is equipped with ⅛-in. mesh cloth on the lower decks to remove dust and fines which are carried to a bin by a common spout under each row of screens. Three additional sizes are taken off to bins by the top decks of each set of screens, while the material passing over the lower decks passes to the next screens below except in the case of the last set of screens, where an additional product goes to the bins.

This system of screening where the fines and dust are removed in each screen is not commonly used and should help considerably in the production of stone that is free from fines and dust.

Another unusual and interesting feature of the screen installation is the progressive increase in screen shaft speed, the shaft of the first screen running at 1000 r.p.m., the second set of screens at 1020 r.p.m., the third

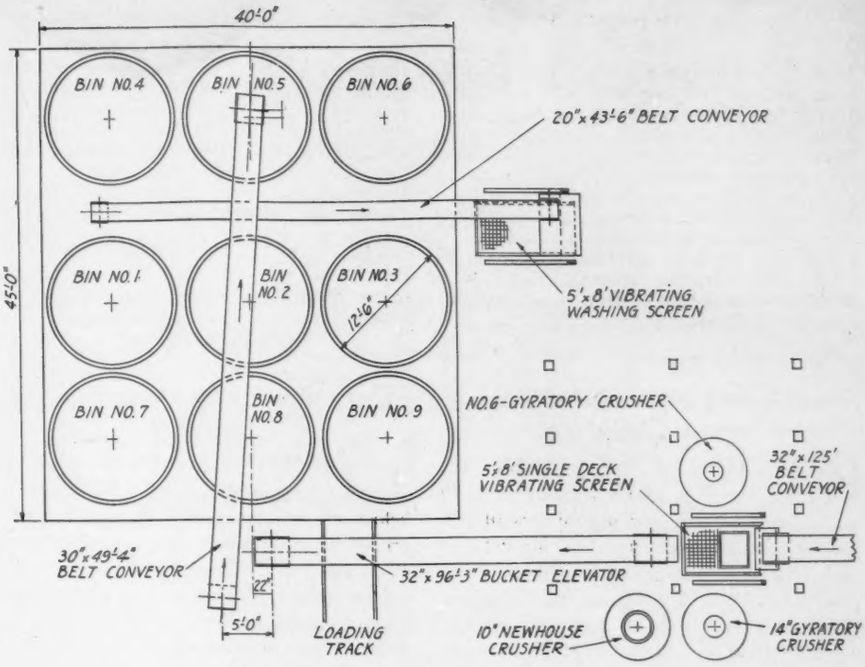
set at 1100 r.p.m. and the last set at 1170 r.p.m.

Washing

Part of the reason for rebuilding the plant was to make provisions for washing the stone, since the state highway department had indicated that it favored that method of preparation. In the reconstruction, the wooden loading bins were replaced by concrete stave silos which rest on the previous reinforced-concrete base. This base, consisting of columns and slab, extends over one railroad track and one truck loading runway.

Nine silos are used, each 12 ft. in diameter by 25 ft. high, and arranged in three rows, with a space between two of the rows for a belt conveyor extending out to the washing screen at one side. The screen house above the silos is of steel construction with corrugated galvanized iron covering and has five floor levels.

Material to be washed is drawn from the side of any of the six silos on to a 20-in. by 43-ft. belt conveyor which carries over to a 5- by 10-ft. Niagara double-deck vibrating screen, arranged with jets for washing. This screen is equipped with 5/8-in. and 1/8-in. mesh cloth and is so located that the washed material is spouted direct to the car.



Plan of bins and recrushers

General

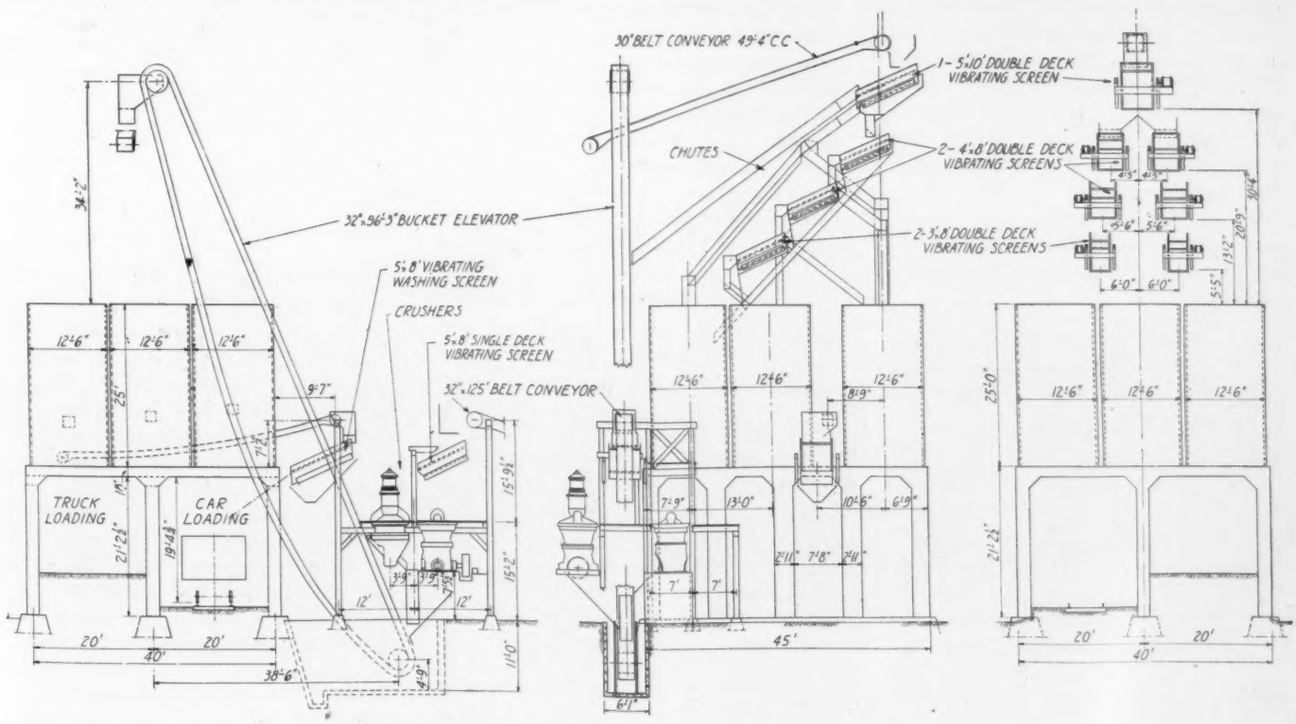
The plant is motor driven throughout, using purchased power at 11,000 volts, which is transformed down to 3-phase, 25-cycle, 440 volts.

Stock piles of various sizes of crushed stone are maintained, the surplus being moved out from the bins in a standard gage 12-yd. side-dump car and dumped. This is stockpiled by a crawler type Browning crane and clamshell bucket. The various sizes are loaded out of stock by means of a 35-B Bucyrus electric caterpillar-mounted shovel or by the Browning crane. A 20-ton Plymouth gasoline locomotive is used for switching cars.

For secondary drilling in the quarry Ingersoll-Rand Jackhamer drills are used, air being supplied by a Sullivan air compressor. Well-drill bits are sharpened by an Armstrong sharpener.

In addition to supplying crushed stone for aggregates and road construction the company also furnishes the stone for a Kolite asphalt road material plant of 400 tons per day capacity adjoining the stone plant. The plant is located on the Canandaiga branch of the New York Central lines.

The offices of the company are at the plant. A. B. Caldwell is president and F. T. Bibb is superintendent. N. H. Sturdy, consulting engineer, Chamber of Commerce Building, Buffalo, N. Y., drew the plans for the reconstruction.



Side and end elevations of screening and loading plant

MOTORS AND DRIVES AT PLANT OF GENESEE STONE PRODUCTS CORP.

Unit	Drive	Motor
30-in. gyratory crusher	Texrope	125-hp. General Electric
32-in. inclined belt conveyor	Morse silent chain	75-hp. General Electric
5 by 8-ft. vibrating screen	Texrope	10-hp. General Electric
10-in. Newhouse crusher	Direct	100-hp. Allis-Chalmers
14-in. gyratory crusher	Texrope	75-hp. General Electric
6-in. gyratory crusher	Belt	75-hp. vertical
32-in. by 96-ft. bucket elevator	Morse silent chain	75-hp. General Electric
32-in. by 49-ft. belt conveyor	Morse silent chain	25-hp. Westinghouse
5 by 10-ft. vibrating screen	V-belt	10-hp. General Electric
4-4 by 8-ft. vibrating screens	V-belt	5-hp. General Electric
2-3 by 8-ft. vibrating screens	V-belt	5-hp. General Electric
20-in. by 43-ft. belt conveyor	Morse silent chain	5-hp. General Electric
5 by 10-ft. vibrating screen	V-belt	10-hp. General Electric

Sources of United States Supply of Chalk

PRODUCTION of "true chalk" in the United States is confined almost entirely to Alabama. There are possibilities of important output elsewhere, but present requirements are met largely by imports from France, the United Kingdom and Belgium. Whiting (true chalk in a pulverized and purified form) is manufactured in domestic plants from European chalk. It is in demand for the manufacture of calcimine and cold-water paints, putty, glazes, enamels, paper and other products. Substitutes are manufactured from ground limestone, marble, marl or similar substances, but are not satisfactory for all purposes for which whiting from true chalk is required. Calcium carbonate—in this case the calcareous remains of small marine organisms—is the essential component of true chalk, which contains nothing else in its pure state, but as found usually includes silica, clay, flint or other impurities.

The white chalk for sale as such, or for manufacture of whiting, is mined preferably from cliffs or hillsides rather than from below ground level. Mining operations below sea level are considered impractical on account of the increased cost of production. Mining is by pick and shovel, and some hand selection is used to insure uniformity of size in the pieces of blocks.

The accompanying table shows both imports and exports of manufactures in 1929 and 1930 as reported by the Department of Commerce.

UNITED STATES FOREIGN TRADE IN CHALK AND MANUFACTURES

Country of origin	Imports: Crude chalk 1929 Long tons	Imports: Crude chalk 1930 Long tons	Imports: Manufactures 1929 Pounds	Imports: Manufactures 1930 Pounds	Exports of manufactures 1929 Pounds	Exports of manufactures 1930 Pounds
Argentina	.....	.....	.....	.....	20,317	24,214
Australia	.....	.....	.....	.....	28,581	16,619
Belgium	2,060	2,937	44,048	.....	.....	.....
Brazil	.....	.....	.....	.....	33,843	17,623
Canada	1	.....	.....	.....	675,149	573,084
Cuba	.....	50	27	.....	84,058	79,161
France	61,438	77,174	40,278	5,695	.....	.....
Germany	.....	.....	197,521	84,806	.....	610
Italy	.....	.....	80,723	581	.....	24
Japan	.....	.....	5,015	25	41,522	38,763
Latvia	.....	.....	244,800	210,200	.....	.....
Mexico	.....	25	.....	.....	27,497	30,170
Peru	.....	.....	.....	.....	30,200	3,068
Philippines	.....	.....	.....	.....	283,873	115,603
South Africa	.....	.....	.....	.....	28,445	59,598
Sweden	.....	.....	.....	.....	29,940	13,370
United Kingdom	39,064	22,680	4,016,206	1,939,179	1,560	2,725
Other countries	.....	.....	1,834	1,718	165,626	98,869
Total	102,563	102,866	4,630,452	2,242,204	1,450,611	1,073,501

Rock Products in the Plastics Industry

THE PLASTICS INDUSTRY has resulted largely from its ability to cut costs below natural materials or because qualities are combined which do not exist in natural materials. Plastics, sometimes called compositions, consist of a number of molded substances, which in their final state assume varied characteristics, depending on their composition. Telephone receiver parts, knife and tool handles, silent gears, armature parts and fountain pens are among the many things in which plastics are now generally employed. New uses and applications are being found daily for these plastics and new properties are being obtained with increasing knowledge of their production.

The moldable substances are obtained by chemical action on a wide range of organic materials. Pigments and soluble dyes are used as coloring materials. Fillers include mineral powders such as clay and talc, used principally for reducing costs; asbestos, which imparts toughness and resistance to heat; mica for its effect on electrical properties; and vegetable fiber for toughness.

In commenting on the growth and outlook of this industry recently the *Index* said: "The plastics industry is of such recent growth and so diversified that comprehensive statistics covering all branches of production are not available. The Bureau of Census estimates the production of pyroxylin plastics made in the United States amounted to 17,859,469 lb. in 1925 and 25,283,235 lb. in 1929. The leading trade paper of the industry in this country gives the total value of all plastics in 1914 as approximatey $14,500,000 and states that it is now over $219,000,000 per year." The *Index* also says: "Those best acquainted with the industry consider that, despite its amazing growth, it is still in the early stages of development, with immense potentialities before it. Indeed, it is considered by many to give promise of becoming one of our foremost industries."

Certainly it behooves rock products producers who find their products adaptable to the requirements of this infant industry to investigate and cultivate it thoroughly.

Nitrate Deposits in United States Worthless

THE UNITED STATES might as well give up the idea of producing commercial nitrate from deposits found within its borders, says a statement issued by the Geological Survey, and resign itself to dependence on by-product or synthetic sources of nitrogen or upon nitrate imported from Chile. The Geological Survey has reached this conclusion after 20 years of search and examination of prospects.

The findings with relation to the sources of nitrates are announced in Geological Survey Bulletin 838. One of the purposes of its publication, it is said, is as a warning to the public against certain stock promotion enterprises with claims of nitrate deposits as their basis.

The report gives general information on nitrates and discusses deposits by counties in 23 states distributed throughout the country. It states that the United States is not dependent on its own natural nitrate deposits for supplies for fertilizer and other uses. In addition to imported supplies of Chile nitrate, there are being produced in this country increasing quantities of by-product and synthetic nitrogen compounds, which bid fair within a few years to give the country complete independence in this essential requirement.

Manufacturing Expense Budget

THE FUNDAMENTAL practices of industrial organizations in developing and administering budget control are outlined in a report entitled "The Manufacturing Expense Budget," published by the Policyholders Service Bureau of the Metropolitan Life Insurance Co., New York, N. Y.

The report is based on a survey of the budgetary practices of a number of manufacturing organizations. The problem of manufacturing expense control and the several types of budget used for this purpose are described and illustrated, and the complete procedure of four companies is outlined and analyzed in some detail. The publication also reproduces several charts and forms that are used in connection with this method of control.

The Manufacture of Portland Cement*

Part IV—Cement Composition and Constituents

By S. E. Hutton
Consulting Engineer, Seattle, Wash.

THOUGH, to the uninitiated, the identity and nature of the constituents of cement, and the percentages in which one or another of them may be present, may seem to be an academic matter of no commercial significance, that is not the case. Notwithstanding that all cements on the market must meet and may exceed the requirements of the standard cement specifications, different brands do differ materially in some respects from one another, as do different samples of some brands. These differences, in some cases unavoidable and in some cases intentional, account for preferences as to brands, and often for embarrassing questions from cement users as to causes and consequences of such differences.

Raw materials from which cement is made vary from plant to plant, and from time to time in almost any plant. An empirical formula which is satisfactory at one place or at one time may not be so at another. Knowing the chemical constituents formed in the process of making good cement, a rational formula takes the place of all empirical formulas, and is superior to them, even though it covers only 95 to 98% of the total contents of the cement. Furthermore, it paves the way toward finding means for determining whether from the raw materials put into cement the desired constituents have been formed, and in what proportions they are to be preferred.

It is not possible to give here credit to all contributors to the present-day knowledge of the constitution of cement. The history of the search for a knowledge of the constitution of cement is reviewed briefly in Rock Products, August 21, 1926, pp. 64-66, and in his book, "Portland Cement," by the late Richard K. Meade, and by R. H. Bogue in Paper No. 3 of the Portland Cement Association Fellowship at the Bureau of Standards (*Concrete*, C.M.S., July, 1926, to February, 1927).

The findings made or confirmed by the investigators at the Geophysical Laboratory of the Carnegie Institution and at the United States Bureau of Standards are accepted and are used in the following articles.

1. Composition and Constituents

Portland cement probably had its origin in a series of accidental discoveries; first, that impure limestones, containing clay substances mixed with calcium carbonate, when burned, had "hydraulic" properties, that is, would harden in water; then, that natural mixtures, high in clay, did not slack, but, when finely ground, would harden in water; and, finally, that from finely ground artificial mixtures of limestone and clay, products equal in value to those from natural mixtures could be made.

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Editor's Note

***THIS ARTICLE** discusses in a general way the principal constituents of portland cement and how the proportions of the raw mix are arrived at under the usual practice.*

The reader will find it particularly helpful to read this and succeeding articles along with the series on "Recast Analysis and Its Relation to the Chemistry of Portland Cement," by Louis A. Dahl, which is running in concurrent issues of Rock Products.

—The Editor.

By the destructive analysis of cements, the percentages of lime, silica, alumina, iron oxide and the minor components present in them could be found and they could be imitated by mixing calculated proportions of limestone and clays of known composition; but, in the early days, the chemical combinations in which the component elements were present in cement were not known. The combinations in minor constituents are still in some doubt. It was observed that certain ratios between the various oxides—lime, silica, alumina, etc.—were within certain limits in satisfactory cements, and the use of such ratios has been relied upon chiefly for controlling the composition of the raw mixes for cement making.

There is now, due to extensive intricate researches, a general agreement of opinion, in America at least, as to the chemical composition of the principal constituents of cement, so that desirable ratios of the oxide components can be fixed with greater precision and used with greater confidence. It is reasonable to expect that in time the cement technologist's habit of thinking and of comparing cements in terms of ratios of oxide components will be superseded by the practice of dealing with percentages of definite chemical constituents in cements.

When we speak of the composition or of the components of cement, we refer to the materials or elements which, combined under proper conditions, would produce cement, or to the oxides into which we could break cement down. The constituents of cement are the chemical compounds that actually exist in cement.

2. Cement Analyses

The ordinary analysis of cement gives the materials out of which, or out of the equivalents of which, the cement can be made, not a list of the chemical compounds or minerals of which the cement is actually composed. The latter can be estimated from the former, assuming that the necessary reactions involved in burning cement were complete, and that we have been successful in imitating cement synthetically with known chemical compounds and in identifying such compounds in cement.

Below is given a table of the approximate ranges within which the oxide components of a number of good cements vary, the analyses of a number of good cements, and the potential constituents of them. No sweeping conclusions as to relations between strength and composition of cement should be drawn from these meager data, which are intended to give only a general idea of permissible ranges in composition, and a few specific examples. Actual (not the 200-mesh) fineness has a marked effect on strength.

TABLE I—RANGE AND TYPICAL COMPONENTS OF CEMENT

Formula	Range, %				
Insoluble	0.1-0.5	0.18	0.14	0.13	0.20
SiO_2	20-24	23.72	24.18	21.68	21.18
Al_2O_3	4-7.5	4.66	3.88	7.03	6.27
Fe_2O_3	2-5	2.14	3.58	2.97	3.03
CaO	60-67	66.11	65.07	63.52	65.19
MgO	0-4	1.45	1.51	2.08	1.92
SO_3	1-2	1.60	1.51	1.74	1.39
Ignit'n loss	1-2	0.65	0.98	0.99	1.33
Free lime	0.5-2	0.78	1.80	1.74	2.22
Potential constituents					
$4CaO, Al_2O_3, Fe_2O_3$	6.5-15	6.5	10.9	9.0	9.2
$3CaO, Al_2O_3$	3-14	8.7	4.2	13.6	11.5
$2CaO, SiO_2$	19-44	32.8	40.7	39.5	26.8
$3CaO, SiO_2$	30-56	46.7	38.0	30.1	45.0
$CaSO_4$	.....	2.7	2.6	2.9	2.4
Fineness and tensile strength					
Through 200 mesh		93.7	93.6	88.7	87.1
1/3 briquets					
24 hours		175	110	135	130
72 hours		310	245	295	285
7 days		485	340	380	395
28 days		505	465	425	460

Because alumina and iron oxide have, in some respects, similar effects in cement, they are frequently grouped together and represented by the formula R_2O_3.

Although very delicate instruments, precise methods and great skill are used in making chemical analyses, some conditions

are not under control, and practices and skill vary, with the consequence that analyses and the calculated constituents of cements should not be regarded as accurate beyond the first decimal place. Usually the minor components are not determined.

3. Significant Ratios in Composition

It was natural to conclude, from the fact that cement could be made from certain mixtures of limestone and clay, that the relation of lime, the alkaline constituent derived from the limestone, to the acid silica and alumina constituents of clay, was the important consideration in cement making; and the early ratios used in controlling cement mixes included only lime and silica, or lime and silica and alumina. Later it was learned that iron is a valuable component, if the cement is not to be white, and the ratio of lime to the sum of the silica, alumina, and iron oxide in the mix was used. Obviously, even this ratio could not be rational unless lime combined with silica, alumina, and iron oxide in cement in identical ratios, which it does not, so it has been necessary to introduce factors related to the combining ratios of lime with the other components.

Magnesia, and other materials such as titanium, manganese, sodium, potassium, etc., may combine with lime in making cement, but they are present in such small quantities that such combinations may be neglected without serious error. It was also found that the percentage of alumina present in cement had an important effect on its qualities, and it was formerly the practice to be guided in this respect by the silica-alumina ratio. Iron also affects the qualities of cement, and it is important to consider the alumina-iron ratio, the ratio of silica to alumina and a fraction of the iron oxide, and the ratio of lime to the sum of the silica, alumina, and iron oxide, each multiplied by an appropriate factor.

Such ratios are useful in superficial considerations of raw materials, and in checking up mixes of materials whose general properties are well known; but as a means of gaining an understanding of the theoretical basis of cement making, or of judging raw materials competently, or of controlling an operation most intelligently and economically, they are unnecessarily involved, are lacking in accuracy, and are more or less an obstacle to a simple approach and an easy grasp of the subject.

The properties of cement must be due to the constituents formed from the elements present, and if we can identify those constituents, we should judge cement in terms of them, rather than in terms of one or more of the innumerable ratios that can be formed between one and another, or between one and several others of the elements or oxides from which the cement could be made.

4. The Principal Constituents of Cement

Calcium forms many compounds with oxygen and silicon, aluminum, and iron, the elements being present in the proportions necessary to form oxides of calcium, silicon, aluminum, and iron; and, although the oxides are not present as such, it is convenient and customary to write their chemical formulas as if they were. For example, tricalcium silicate is written $3CaO, SiO_2$. In like manner, for convenience, the raw materials for cement making are dealt with as if they were actually made up of oxides.

The important compounds of calcium present in cement are:

Tricalcium aluminate .....$3CaO, Al_2O_3$
Dicalcium silicate .....$2CaO, SiO_2$
Tricalcium silicate .....$3CaO, SiO_2$

If iron is present, as it always is to some extent:

Tetracalcium alumino ferrite.....
.....$4CaO, Al_2O_3, Fe_2O_3$

The cement maker's chemical tasks are, first, to exclude from his cement forbidden materials and excess of inert components, and then to include in it proper proportions of these four constituents. In the kiln, the compounds of lime with alumina and iron oxide form first, then the dicalcium silicate, and finally, from dicalcium silicate and lime, the tricalcium silicate. Consequently, with clay of a given composition as to silica, alumina, and iron oxide, limestone can be used in one ratio to give a low percentage of tricalcium silicate, or in a higher ratio to give a higher percentage of tricalcium silicate.

Two indispensable constituents of cement are tricalcium aluminate to cause setting within a reasonable time, and tricalcium silicate to cause early hardening and to develop early strength. Dicalcium silicate appears to be largely responsible for gaining or maintaining strength in concrete beyond ages of about one month.

Examinations of a great number of samples of cement show that, at least in so far as strength in concrete is concerned, cements may vary widely in the proportions of their four principal constituents, and serve all ordinary purposes. Variations in fineness, for which no reliable and satisfactory precise measure has been found, no doubt obscure some effects of composition on strength.

5. Lime Required to Combine with Acid Oxide Components of Cement

In the burning of cement clinker, several compounds of lime and alumina are formed, but the final product, if no iron is present, is tricalcium aluminate, $3CaO\text{-}Al_2O_3$. The molecular weight of lime (CaO) is 56.07 $(40.07 + 16)$, and of alumina is 101.94 $(2 \times 26.97 + 3 \times 16)$, so that one part by weight of alumina requires 1.65 parts $(3 \times 56.07 \div 101.94)$ of lime to form 2.65 parts of tricalcium aluminate, the molecular weight of which is 270.15 $(3 \times 56.07 + 101.94)$.

This is shown more clearly in the following table which gives the molecular weights of the components and their ratios.

Tricalcium aluminate

Molecular weights

$3CaO$	$= 3(40.07 + 16)$	$= 168.21$
Al_2O_3	$= 2 \times 26.97 + 3 \times 16 =$	101.94
$3CaO, Al_2O_3$		$= 270.15$

Ratios of components

$$\frac{3CaO, Al_2O_3}{Al_2O_3} = \frac{270.15}{101.94} = 2.65$$

$$\frac{3CaO}{Al_2O_3} = \frac{168.21}{101.94} = 1.65$$

If iron and alumina are both present in the raw mix, there will be formed tetracalcium alumino ferrite, $4CaO, Al_2O_3, Fe_2O_3$, to the extent that the necessary components are present in the proper proportions. Usually the ratio of alumina to iron oxide is such that a surplus of alumina is present, and tricalcium aluminate, also, is formed. If there is a surplus of iron oxide, dicalcium ferrite, $2CaO, Fe_2O_3$, is formed. The numerical relations of the components of tetracalcium alumino ferrite, sometimes for convenience written C_4AF, are shown below.

Tetracalcium alumino ferrite

Molecular weights

$4CaO$	$4(40.07 + 16)$	$= 224.28$
Al_2O_3	$2 \times 26.97 + 3 \times 16 =$	101.94
Fe_2O_3	$2 \times 55.84 + 3 \times 16 =$	159.68
$4CaO, Al_2O_3, Fe_2O_3$		$= 485.90$

Ratios of components

$$\frac{4CaO, Al_2O_3, Fe_2O_3}{Fe_2O_3} = \frac{485.90}{159.68} = 3.04$$

$$\frac{4CaO}{Fe_2O_3} = \frac{224.28}{159.68} = 1.40$$

$$\frac{Al_2O_3}{Fe_2O_3} = \frac{101.94}{159.68} = 0.64$$

From the above data it is clear that one part of iron oxide combines with 0.64 part of alumina, and 1.40 part of lime, to form 3.04 parts of tetracalcium alumino ferrite; also, that for each part of iron oxide in the raw mix, 0.64 part of alumina will not be available to form tricalcium aluminate. Obviously, if iron oxide is present in the raw mix to an extent greater than 1.566 times the alumina $\left(\frac{1.00}{0.64}\right)$, there will be no tricalcium aluminate, but some dicalcium ferrite formed.

Lime present in the raw mix, in excess of that required to combine with alumina and iron oxide, will combine with silica to form dicalcium silicate, $2CaO, SiO_2$, and tricalcium silicate, $3CaO, SiO_2$. Due to variations in distribution of material and temperature, various reactions go on concurrently in the kiln, but as a means of simplifying discussions they are carried on as if one reaction were completed before another began. Thus, it is convenient to carry out calculations as if all the silica present in the cement raw mix first combined with lime to form dicalcium silicate, and, then, the excess

of lime combined with some of the dicalcium silicate to form tricalcium silicate.

For one part of silica in the raw mix, 1.87 parts of lime would be required to form with it 2.87 parts of dicalcium silicate.

Dicalcium silicate

Molecular weights

$2CaO$	$2(40.07+16) =$	112.14
SiO_2	$28.06+16\times 2 =$	60.06
$2CaO, SiO_2$	$=$	172.20

Ratios of components

$$\frac{2CaO}{SiO_2} = \frac{112.14}{60.06} = 1.87$$

$$\frac{2CaO, SiO_2}{SiO_2} = \frac{172.20}{60.06} = 2.87$$

In a complete reaction in a cement raw mix, the quantity of tricalcium silicate is determined by the quantity of lime remaining after the requirements of iron oxide and alumina and that of silica necessary to make dicalcium silicate are satisfied. Each part of lime so remaining will combine with 3.07 parts of dicalcium silicate to form 4.07 parts of tricalcium silicate.

Tricalcium silicate

Molecular weights

CaO	$40.07+16$	$=$ 56.07
$2CaO, SiO_2$		$=$ 172.20
$3CaO, SiO_2$		$=$ 228.27

Ratios of components

$$\frac{3CaO, SiO_2}{CaO} = \frac{228.27}{56.07} = 4.07$$

$$\frac{2CaO, SiO_2}{CaO} = \frac{172.20}{56.07} = 3.07$$

Obviously, any lime present in excess of that which could be combined with the dicalcium silicate present must remain as free lime. Actually, materials are never so finely ground, so intimately mixed, and so perfectly heated that the reaction is complete if lime is present to such an extent as to make the silica appear almost wholly in tricalcium silicate. Extremely fine grinding of raw materials, grinding and reburning of clinker, and unusual care in burning clinker have been resorted to as means of holding free lime within reasonable limits and securing high tricalcium silicate contents in high early strength cements.

From the following it is clear that one part of silica, by weight, can combine with 1.87 parts of lime to make 2.87 parts of dicalcium silicate, or with 2.80 parts of lime to make 3.80 parts of tricalcium silicate.

$$\frac{2CaO}{SiO_2} = \frac{112.14}{60.06} = 1.87$$

$$\frac{3CaO}{SiO_2} = \frac{168.21}{60.06} = 2.80$$

Summarizing all this, there must be present in a cement raw mix sufficient lime (or really its equivalent in calcium carbonate) to combine with the iron oxide and some of the alumina to form tetracalcium alumino ferrite, to combine with the remaining alumina to form tricalcium aluminate, and to combine with the silica to make dicalcium silicate and tricalcium silicate in desirable or acceptable proportions.

If dicalcium and tricalcium silicates are to be present in equal parts, the ratio of lime, available for silicates, to silica must be 2.27. The ratio of dicalcium silicate to tricalcium silicate has been found to vary in good cements from 25:75 to 60:40, which means that the ratio of lime, available for the formation of silicates, to silica in the cement may vary at least from 2.50 to 2.20.

The constant by which the silica content is to be multiplied in order to find the lime required to produce dicalcium and tricalcium silicates in any desired ratio, is found by calculating the ratio of lime to silica in a mixture of the two silicates in the desired ratio. In tricalcium silicate, the lime content is 73.69%, and the silica content is 26.31% of the compound, obtained by dividing the molecular weight of the lime (168.21) and the molecular weight of the silica (60.06) by the molecular weight of the compound (228.27). Of dicalcium silicate, 65.12% is lime and 34.88% silica. Then, for equal parts of the two silicates in a mixture of

1 part C_3S = 0.7369 part lime to 0.2631 part silica and
1 part C_2S = 0.6512 part lime to 0.3488 part silica
a 1:1 mixture = 1.3881 parts lime to 0.6119 part silica

The ratio of lime to silica in a mixture of equal parts of dicalcium silicate and tricalcium silicate is $1.3881 \div 0.6119 = 2.2685$. In a mixture of six parts of tricalcium silicate to four parts of dicalcium silicate the constant is

6 parts C_3S = 4.4214 parts CaO to 1.5786 parts SiO_2
4 parts C_2S = 2.6048 parts CaO to 1.3952 parts SiO_2

7.0262 / 2.9738

and $7.0262 \div 2.9738 = 2.3627$

RATIOS OF LIME TO SILICA

(In mixtures containing various percentages of tricalcium silicate and dicalcium silicate)

Percentages of silicates		Ratios	
C_3S	C_2S	$C_3S : C_2S$	$CaO : SiO_2$
90	10	9.0000	2.6809
87.5	12.5	7.0000	2.6521
85	15	5.6667	2.6237
80	20	4.0000	2.5683
75	25	3.0000	2.5146
70	30	2.3333	2.4624
65	35	1.8571	2.4119
60	40	1.5000	2.3627
55	45	1.2222	2.3149
50	50	1.0000	2.2685
45	55	0.8181	2.2233
40	60	0.6667	2.1794
35	65	0.5385	2.1367
30	70	0.4286	2.0951
25	75	0.3333	2.0546
20	80	0.2500	2.0151
15	85	0.1765	1.9766
10	90	0.1111	1.9391

Note: Ratios are given to four decimal places for use in curve plotting. Two places are adequate in calculations.

In the preceding table, relations between the tricalcium and dicalcium silicate contents in a cement are given in terms of the percentage of each in the total of silicates present, and as a ratio of tricalcium silicate to dicalcium silicate. The first is useful in judging potential strength characteristics, the second in judging probable difficulties in burning the clinker. In the last column is the ratio of lime to silica in the two silicates combined.

Sulphur trioxide in the analysis of cement, and free lime in the analysis of either clinker or cement, must be taken into account in calculating their probable constituents. It is generally assumed, without serious error, that SO_3 is present as calcium sulphate, $CaSO_4$, so that for each part of SO_3 present, 0.70 part of lime, as well as any free lime, must be deducted from the total lime to find how much is available for the formation of aluminates, ferrites, and silicates.

Calcium sulphate

Molecular weights

CaO	$40.07+16$	$=$ 56.07
SO_3	$32.06+3\times 16$	$=$ 80.06
$CaSO_4$		$=$ 136.13

Ratios of components

$$\frac{CaSO_4}{SO_3} = \frac{136.13}{80.06} = 1.70$$

$$\frac{CaO}{SO_3} = \frac{56.07}{80.06} = 0.70$$

Expressed in a formula, using percentages from a cement analysis, in a good cement,

Total CaO — free CaO = 0.70 SO_3 + 1.40 Fe_2O_3 + 1.65 (Al_2O_3 — 0.64 Fe_2O_3) + (from 2.24 to 2.56) SiO_2 = 0.70 SO_3 + 0.35 Fe_2O_3 + 1.65 Al_2O_3 + (2.24 to 2.56) SiO_2.

Numerous formulas similar to this have been used both in designing cements and in judging the qualities of cements from their analyses, but none is repeated here, for it must be clear, from the intricate interrelations of the components of raw mixes and of the constituents of cements, that all such formulas are more or less irrational, and that they may be innumerable.

(*To be continued*)

Asbestos Production in Canada

ASBESTOS shipments in March showed a 16.0% recovery to 8937 tons as compared with the February total of 7706 tons, according to the Dominion Bureau of Statistics at Ottawa. Production during the first quarter of 1932 totaled 26,833 tons, a decline of 32.7% from the shipments of 39,842 tons in the corresponding period of 1931.

In March, Canadian producers exported 10,257 tons of asbestos valued at $271,973; during the previous month 7747 tons at $200,706 were exported. Manufactures of asbestos to a value of $6629 were shipped from Canada as against the February total of $5917.

Problems and Policies of the Lime Industry*

By Charles Warner

IT HAS BEEN SEVERAL YEARS since I have been actively associated in the management of the National Lime Association. A lot of water has gone over the dam. Men and methods have changed. The years have been filled with experiences—some good and some bad—but all of real, permanent value for the future, if carefully analyzed and used in planning for what lies before us.

I am probably the only one here who participated over thirty years ago in the initial planning and organization meetings of the original National Lime Association, held successively at Cincinnati and Toledo. Some of those earlier contacts with your predecessors in the lime industry are as clear to me today as the experiences of the past year. Most of those men have passed to their great reward, and their earnestness and sincerity in working through the earlier period of the formation of this association certainly entitled them to all that great reward can give them.

Having shared with others the responsibility of directing the destinies of the National Association for some years, it is only natural that my personal interest in the work of the association should continue and that I should feel a keen desire to aid the management with advice whenever possible, with the hope that it will be of some constructive value. I, therefore, welcome this opportunity to discuss some of the problems of the day, as viewed by one who hopes that his judgment has been mellowed by time, experience and unbiased observation, and who is in full sympathy with the responsibilities of those in the harness.

First of all, I would like to say that I think the National Association has a clearer conception of its duties and functions than ever before. I can speak with some authority when I say this, since some of the experiences during the time of my active association efforts clearly showed that policies and methods successfully applied in other associations were not workable in the Lime Association.

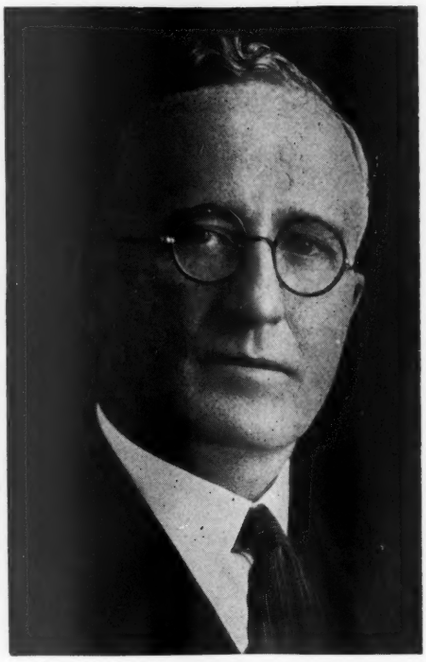
Unlike other materials which have well-defined specification standards, such as portland cement, steel, etc., lime is, generally speaking, entirely lacking in standards. Limestone and lime vary widely, both physically and chemically, in different sections of the country, and in addition it has been largely impossible to apply any standards in the burning of lime that will insure in advance a product of a given specification.

The same stone reacts differently under different methods of burning. So, too, the same method of burning reacts differently with different characteristics of stone.

*Presented at the annual meeting of the National Lime Association, Cleveland, May 25, 1932.

Helpful to All Industries!

WHILE specifically addressed to his associates in the lime industry, Mr. Warner's paper is of almost equal interest and value to every other rock products industry. It is the résumé of a business philosopher. And until we can all be philosophers we miss most of the genuine satisfactions and real success in life.—The Editor.



Not So Much Need of Research

Under such conditions it has become rather apparent that a national association cannot be of much use in specific or practical research work as applied to the lime industry, although there are doubtless certain broad fields of basic or pure research that might be of some value to follow. Results of practical or commercial value from national research are uncertain. If definite lines of pure science could be followed for a long term, backed up by adequate capital, we might get somewhere; but it has been demonstrated to be impractical for our National Association, with its always unpredictable future and the varying moods of its supporters, to follow through on such work.

In many ways, lime is a local proposition. Prevailing low prices still further localize the market of each plant. It is natural, therefore, that there exist all over the country local conditions concerning the marketing of lime that differ materially. As a result, what may be good practices and methods for lime manufacturers in one locality may be entirely unsuitable in another. The policies of the National, therefore, must be broad enough to leave to each district its own problems for solution, and confine its efforts to advising and guiding, in so far as possible, the district policies, in order that there may be a minimum of conflict between districts and with national policies. There is certainly important work for our national body in handling many problems where districts overlap and conflict in sales and promotional work.

Local Organizations Desirable

As an example of district effort, it is interesting to note that the National Lime Association reports a total consumption of all agricultural liming materials for the year 1931 of 2,550,000 tons. Of this amount, 310,000 tons, or 12%, was burned or hydrated lime. In the Mid-Atlantic States, where the Quality Lime Institute is doing promotional work, 67% of the burned lime was sold, while only 10% of the total of ground limestone, marl, etc., was used. Or, in this district, of a total of 493,000 tons of liming materials, 42% was burned or hydrated lime, as compared with 12% for the country.

The same arguments can be used, in so far as research into the various uses for lime is concerned, but in a more general way. A lime inferior in chemical and physical analyses may be better suited for a certain industrial use than a lime that is superior chemically and physically. The relative values of magnesium and high calcium lime is an old story to all of us. It is clearly obvious, therefore, that, to unify the support of the Lime Association by all lime manufacturers in order that it might promote the general use of lime, as such, and defend it against attack from competing industries, extreme care must be taken to deal with all subjects in very general terms, lest, unwittingly, the interests of some manufacturers may suffer.

This is what my years of experience have taught me, and is the reason why I advocated, and heartily supported, the association's set-up and budget, as proposed three years ago, as being not only the desirable budget, but the ultimate to be desired under the conditions now existing. That budget

proposed a staff substantially as has existed for the past two years, and which I believe is the minimum that can give the service and attention to matters vital to the industry, demanded of it by consumer and manufacturer. It also provided for a moderate amount of national advertising, which is certainly desirable, when funds are available, to support and back up the personal activity of the association staff.

I cannot help but feel that those who have not been actively identified with the association work do not fully appreciate the many opportunities it has to render service for lime in a quiet and almost routine manner, in thousands of cases that would never be brought to the attention of the lime industry were it not for the National Association.

Unity the Chief Need

Beyond the direct work of promoting the use of lime and defending the industry from attacks of competing industries, lies another broad field of work which the National Association must assume as one of its major responsibilities. In these times more than ever before, the industry must be unified, if it is to defend itself successfully against either or both of two evils: self-destruction by reason of unfair and ignorant competition within the industry, or destruction from without by organized competition, fair or unfair.

Three years ago, under the auspices of the Federal Trade Commission, the lime industry held a Trade Practice Conference in Washington and adopted certain rules of fair practices for its guidance. Unfortunately, it has since been found that there were no teeth in the Federal Trade Commission Act providing for the enforcement of rules adopted. There is, however, much agitation for real enforcement provisions, and several bills in this session of Congress provide for such. While it is improbable that any action will be taken in this session, I am very hopeful for the future.

It does seem to me, however, that since that conference, partially as a result of it, partially as a result of the business conditions of the past three years, and partially due to the good work that Mr. Hough has been doing, there is a growing sense of industry responsibility on the part of manufacturers. There seems to be a greater realization of the necessity for cooperation between manufacturers, particularly as to fair and decent marketing practices and a recognition of the rights of the other fellow. It has become more and more apparent that we shall all swim together or sink together. There is more of a tendency to view a situation through the other fellow's eyes as well as our own, and to realize that what may be good for us may be bad for him, in which case there is a compromise ground that must be found and can only be found by frank, honest cooperation to learn the facts and ultimately arrive at the solution that is best for the long pull for all concerned.

We are in the midst, and, I hope, at the bottom, of the most severe business depression that probably any of us has ever experienced. What is this experience going to do to help us to better practices, better conditions, and sounder profits, as we gradually come out of the depression and land in a new level of costs, of sales prices, and of profit-making possibilities?

What We Are Learning

These are days when we must not worry ourselves too continuously with the problems of the moment, but must try to throw our ideas and planning into the future. In fact, this is the only mental policy that can give us any relief and encouragement. I urge, therefore, each of you to utilize your present moments so far as possible in considering safe and sane methods for improving your particular situation and placing it on a sounder basis so that your investment in experience and in capital in the lime industry may honestly yield you the utmost that the future can offer.

There can hardly be a section of this country that has not experienced radical changes in production and marketing situations. These changes provide opportunities for the forward-thinking men of the industry to make, either by purchases or by mergers, alignments which will strengthen their future asset value both as to their earning power as officials and as to their returns on capital invested in our industry.

I know of many spots over the country where, if the various competitors would sanely reconcile themselves to present-day depreciated values brought about by more or less permanent competitive conditions, and would arrange for purchases and sales, or mergers, in line with present-day values so that they may be soundly capitalized for the future, very substantial economies in production and sales would result. Both the buyer and the seller, or the parties merging, should be able to work out sane business deals if they start on sound fundamental values as a basis, and should be able to profit much more fully in the future than by continuing unsound competitive practices and the partial operation of too many high-cost plants.

Utilize Present Opportunities

The fewer companies we have in the lime manufacturing business consistent with the legal restrictions, the more safely will the industry be managed in all respects and the more money will be thrown into sound local research and improvement practices to help bolster the industry as a whole. If I can leave you a message today which I feel is of more importance than any other, it is to urge you to seek most earnestly to utilize the present opportunities to bring about fundamental changes in control and management of the various competitive enterprises in your local districts, so that lasting economies in both production and marketing practices may be accomplished and so that more funds may be available out of these sounder earnings for the future promotion of the lime industry.

As a part of this message of today, I would be remiss if I did not call your attention to the affairs of public administration in state and nation which, in these depressing times, and for the same reason of improving and making safe the recovery, should have the earnest attention of every American citizen. For instance, how many of you know of the big controversy under way in Washington for several months past, to secure the passage of the Home Loan Bank Bill? And how many of you realize the far-reaching effects that administration under this bill will have, first, in improving the consumption of lime products and, second, in providing more modern, sanitary, habitable homes for American citizens of moderate means? How many of you have gotten in back of this bill and used your influence locally and at Washington to have your congressional representatives know what this means to the country and likewise to our industry as well as to many other industries which can be aided, to bring back prosperity through these sane, stimulating practices? All around us there are broad issues of this kind which have a most vital and far-reaching effect on our own future success in business as well as on community improvement and national strength.

Be Philosophic!

It is one of the periodic pleasures that I keenly enjoy to return to these National gatherings and meet you all. I urge that you keep up the good work and continue to spread the gospel of hopefulness and honest cooperation among competitors. As life mellows us, I feel that we appreciate more and more the good will and good wishes of our fellow men. In our passing days it will be one of the greatest individual satisfactions to be able to cherish such regard from those we have known and been associated with in the many years of business activity. If we can carry anything with us into the great future where many of our predecessors have already gone, it is these feelings and sentiments. We certainly cannot carry with us any material assets, and in many cases they do more harm than good when left behind.

Nine Roads to Accidentville

A MAN who takes his safety seriously was asked to explain why certain men persist in violating safety rules. He quickly listed nine reasons which should be of interest to all and especially to the chance-takers. Here they are:

Laziness.
Ignorance.
Dishonesty.
Indifference.
Bullheadedness.
A "know-it-all" attitude.
A lack of mental fitness.
A lack of correct thought.
Inability to concentrate attention.

Are Improved Highways Self-Liquidating?

California's State Highways Have Earned $54,000,000 (Up to June 30, 1930) After Liberal Allowance for Operating Expense, Interest on Investment and Depreciation

BASED ON A SAVING of one and one-quarter cents per mile in reduced fuel and motor vehicle operating costs, California's state highways, up to June 30, 1930, have, after deducting all maintenance, interest and depreciation charges, earned $54,000,000 on their capital investment, according to T. H. Dennis, maintenance engineer, whose article in *California Highways and Public Works,* is abstracted in what follows. During the same period the safeguarding of this investment through maintenance has cost the motor vehicle operator but one-fourth of the earnings effected in each mile operated.

The above statements are based on the utilization of the state highway system as determined from the joint traffic survey of the Bureau of Public Roads of the United States Department of Agriculture and the State Division of Highways, conducted during the period September, 1929, to October, 1930.

The operating differentials used are those developed in 1926 by the Iowa State College Experimental Station to establish the economic relation between surface type and requisite tractive effort. Differentials in gasoline consumption and tire wear were determined on surfaces ranging from gravel to concrete.

Cost Variations

It was found that the costs varied not only with the type of road surface, but with the weight of the vehicle, being higher as the weight increased. For a vehicle weighing 3000 lb. the operating cost per mile varied as shown on the following surface types:

Concrete	$0.0175
Bitulithic	0.0212
Macadam	0.0412
Gravel	0.045

The estimated average saving per vehicle mile in operating on the state highway system as improved in 1930, over what it would have cost to operate on the same mileage of unimproved earth or rock surfaced road, is arrived at by applying the cost per mile, as given above to the mileage by kind of surface in the highway system.

The average cost of operation per vehicle mile over the improved portion of the system, works out as $0.0198 per vehicle mile for the combined high and intermediate types of surface and $0.0284 per vehicle mile for the entire system.

The comparisons for operation over the entire system as well as over the combined high and intermediate types only, are as follows:

	Per vehicle mile
Average cost of operation over an unimproved highway system	$0.045
Average cost of operation over present highway system	0.0284
Estimated saving	$0.0166
Average cost of operation over an unimproved highway system	$0.045
Average cost of operation over the improved portion of the highway system	0.0198
Estimated saving	$0.0252

Since it is our wish to be conservative, we will assume that the savings over the entire system are but ⅔ of the calculated differential or one cent, and that similarly the saving due to operating solely on the improved portion of the highway system is ½ of that shown or 1¼ cents per vehicle mile.

Joint Survey

The joint cooperative survey by the U. S. Bureau of Public Roads of the Department of Agriculture which was carried on simultaneously in Arizona, California, Colorado, Idaho, Nebraska, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming, was made to obtain essential facts about the present density, type, capacities, and distribution of traffic units as a basis for planning highway development to serve present and future traffic.

Originally it was planned to secure this information for California at some 48 representative stations; this number was later expanded to 130 stations in order to cover the entire state highway system. The utilization thus determined was the aggregate total of miles traveled each day by all motor vehicles on the state highway system. This total, expressed as vehicle miles, amounted to 9,662,000 daily vehicle miles, or 3,526,630,000 yearly vehicle miles, including all state routes.

The evaluation of this aggregate yearly vehicle mileage for 1930 at the differential of 1c., assumed as applying to the entire system, would mean a saving of $35,266,300, which is 10% more than the combined highway expenditures for all purposes in that year.

In any business undertaking, public or private, there must first be an outlay of capital. Then, if the enterprise is to be on a sound basis it must earn enough to pay interest on the capital, to pay the operating and fixed charges and to provide for anticipated renewals and replacements. The building and operating of a highway system is a cooperative enterprise of the people of a state, for which they must furnish the capital, and then must pay individually for the use of the facilities. Their profit comes in lowered vehicle operating costs and in more or less intangible benefits.

Total Investment

On June 30, 1930, the people of California had a total capital investment of $172,479,708.08 in their state highways. This amount represents all monies expended in the construction and reconstruction of these roads since their adoption as state highways. The rate and amount of these annual expenditures are shown in the following table from 1912 when the first work began under the 1909 bond issue up to and including 1930, the period covered by the joint survey. This table also shows the aggregate annual sum allowed to cover interest and depreciation on the capital investment during those years.

Applying the operating differential of

ANNUAL CALIFORNIA HIGHWAY EXPENDITURES

Year	Construction	Reconstruction	Maintenance	Administration	Fixed charges* (thousands)
1912	$ 154,195.12	.....	.....	.....	$ 15
1913	1,329,540.99	.....	.....	.....	148
1914	2,371,873.56	.....	.....	.....	386
1915	6,677,309.41	.....	$ 98,355.80	$101,230.90	1,053
1916	6,065,691.79	.....	834,843.50	218,824.08	1,660
1917	1,883,553.30	.....	804,031.76	46,299.30	1,848
1918	4,484,424.74	.....	703,111.84	100,980.60	2,297
1919	4,843,991.43	$ 300.64	1,220,254.07	130,231.84	2,781
1920	7,255,432.15	21,592.28	1,457,912.72	42,581.59	3,509
1921	6,731,048.86	19,201.25	2,167,557.72	226,646.15	4,184
1922	13,967,784.70	18,609.15	3,596,359.53	93,938.04	5,582
1923	14,065,996.51	46,298.08	3,840,738.98	204,937.33	6,994
1924	10,449,932.66	1,836,264.68	3,819,333.59	526,722.83	8,222
1925	7,238,560.34	4,369,895.64	3,655,028.22	857,201.76	9,383
1926	5,147,672.27	6,177,279.68	3,780,470.18	754,271.53	10,516
1927	4,188,410.07	6,815,888.53	5,656,244.73	—269,003.77	11,616
1928	3,506,232.55	7,066,121.67	4,462,993.83	1,269,051.97	12,673
1929	11,816,458.30	8,044,528.28	4,926,454.10	274,259.60	14,659
1930	16,951,153.76	8,934,465.69	6,752,845.54	274,259.61	17,248
	$129,129,262.51	$43,350,445.57	$47,776,536.11	$4,852,433.46	114,774

*Theoretical annual fixed charges, calculated on construction and reconstruction, are based on interest at 5% and depreciation at 5%.

one and one-quarter cents, which was assumed for operating on the improved portion of our highway mileage, to the total aggregate mileage of 17,673,000,000 which resulted solely from operating on the improved portion of the state highway system, the motor vehicle operator up to June 30, 1930, has been saved some $220,912,500.

The yearly rate of this saving and the miles of improved highway on which it was earned are shown in the following table:

ANNUAL SAVINGS IN VEHICLE OPERATION ON IMPROVED HIGHWAY
Covers Only Fuel and Tires

	Miles of improved highway	Annual vehicle miles on improved highways (thousands)	Annual savings at 1.25 cents per vehicle mile
1913	44.6	3,000	$ 37,500
1914	268.0	20,000	250,000
1915	754.3	70,000	875,000
1916	1050.3	140,000	1,750,000
1917	1144.6	200,000	2,500,000
1918	1330.7	260,000	3,250,000
1919	1523.9	400,000	5,000,000
1920	1766.1	530,000	6,625,000
1921	2048.4	750,000	9,375,000
1922	2458.9	1,100,000	13,750,000
1923	2850.9	1,200,000	15,000,000
1924	3129.5	1,300,000	16,250,000
1925	3310	1,400,000	17,500,000
1926	3856	1,400,000	17,500,000
1927	3915*	1,900,000	23,750,000
1928	3974	2,000,000	25,000,000
1929	4059*	2,500,000	31,250,000
1930	4118	2,500,000	31,250,000
		17,673,000	$220,912,500

*Prorated for biennium.

A summary of the above tabulations justifies the following conservative estimate, in round figures:

Savings by the public in decreased costs for fuel and tires on improved portions only		$221,000,000
Operating expense—		
Maintenance and administration (on entire system)	$53,000,000	
Depreciation (5% annually on capital investment)	57,000,000	
Interest on investment at 5%	57,000,000	
		167,000,000
Net savings		$54,000,000
Total capital investment	$172,000,000	
Less depreciation	57,000,000	
Total net value of investment as of June 30, 1930		$115,000,000

On the basis of the depreciation charged, the net value of the investment is $115,000,000. Unquestionably, a highway system is as subject to depreciation as a manufacturing plant. However, the loss is not certain enough to be readily calculable. Physical deterioration is a question whose ultimate decision rests only in exhaustive investigation.

Conservative Figure

The rate of depreciation charged, 5%, is equivalent to allowing a life of only 20 years. For highway purposes this rate is probably the maximum, for such costly items as right of way, grading, and drainage have an enduring worth. The statement of a present value of $115,000,000 is therefore regarded as ultra-conservative.

The investment of $172,000,000 in California's state highway system has therefore profited its motor vehicle users alone some $54,000,000, after allowing for operating expense, interest on the investment and depreciation. On the basis of the savings shown the total cost of maintenance on the entire system has been but one-fourth of the returns realized through operation solely on the improved portion of the highways. Furthermore, these returns will increase yearly, being limited only by the amount of traffic using these roads.

The area of the 11 western states included in the joint survey conducted by the United States Bureau of Public Roads represents more than 37% of the area of the United States and more than 35,000 miles of federal aid highways. It was found that the aggregate total daily utilization of the respective state highways by all vehicles, was 23,062,000 daily vehicle miles or 8,400,000,000 yearly vehicle miles. Of this total 7,500,000,000 were passenger car miles and 900,000,000 were truck miles.

Approximately 15% of the total or 1,200,000,000 vehicle miles represented travel by foreign or out of state vehicles. Since the total vehicle miles expresses the general degree to which the roads are used, California with 36.6% of the total aggregate daily vehicle miles shows the greatest highway usage.

Highways for Transportation

MOTOR FREIGHT is the title of Bulletin 26 recently issued by the American Road Builders' Association, Washington, D. C. The subjects discussed were presented at the motor freight sessions of the Detroit convention of the American Road Builders Convention held in January, 1932.

Subjects included in the report are utility of the highway, summary of 1931 truck legislation, coordination of railway and highway transportation, highway expansion and vehicle use threatened by tax burdens, social and industrial economics of motor distribution, 15 to 50% saving on tires, insurance and complete monopoly of transportation—the purpose of the railroads.

Federal-Aid Highways Built at Lower Cost

THE MILEAGE of Federal-aid road projects approved for construction, on which work had not yet started, showed an increase as of May 31 of more than 200 miles over April 30, while the estimated total cost of the projects declined more than $4,000,000, according to a tabulation of the status of Federal-aid road construction made public June 11 by the Bureau of Public Roads, Department of Agriculture.

The reduced cost for a larger mileage, it was stated orally at the Bureau, reflects at least in part the sharply reduced costs of road construction.

Figures as of June 30, 1931, showed that a mileage of 2,978, more than 1000 miles less than the present approved program, cost a total of $60,165,458, only slightly less than the cost of the present program.

Federal-aid road projects actually under construction showed an increase May 31 over April 30, the estimated total cost of the projects rising from $199,725,939 to $219,647,002 during the month. The total mileage under construction advanced from 8,738.6 to 9,733.8 during the period.

The estimated cost of projects approved for construction, on which work has not yet begun, declined during the month from $73,994,243 to $69,731,729. The mileage approved increased from 3,985.8 to 4,199.9.

The balance of Federal-aid road funds available for new projects was reduced during the month from $82,020,323 to $71,382,727.

Nonmetallic Minerals in Chemicals

DETAILED STATISTICS on chemicals and allied industries in Canada from 1928 to 1930 have been issued by the Dominion Bureau of Statistics. Of interest to the rock products industry is that information regarding fertilizers. The report states that the opening of two new acidulating and mixing plants in 1930 brought the number of operating units to 14. These plants were engaged chiefly in manufacturing mixed fertilizers. Establishments in other industries also made mixed fertilizers as a minor part of their business. This was the only branch of the chemical industry to show an increase in output in 1930 (11%). A total of 78,158 tons of mixed fertilizers were made in Canada in 1930, while 63,259 tons were imported and 5707 tons were exported.

Also of interest is the tabulation of materials and products used in the several classifications covered in the report. An illustration is the adhesives industry. A consumption of 614 tons of lime, 477,245 lb. of soda ash and 1200 tons of superphosphate is shown. The classification, paints, pigments and varnishes, is especially interesting in this regard. A directory of firms in each industry is also given. By studying this report, lime manufacturers and producers of other rock products may find the approximate consumption of nonmetallics in chemicals and the names of those who use them.

Gypsum Production in Canada

THE DOMINION Bureau of Statistics at Ottawa reports that the production of gypsum in Canada during February amounted to 5454 tons as compared with 5762 tons produced in January and 19,162 tons in February, 1931.

No crude gypsum was exported from Canada during February; in the preceding month 60,009 tons were exported to the United States.

Constant Change and Improvement the Rule, Even for New Gravel Plants

Ohio Gravel Co. Makes Significant Improvements at Its Miamiville Plant, New in 1929

NO PLANT in the rock products industry is ever *finished*. Changing conditions, adoption of new types of equipment, constant striving for better and cheaper products make continuous new investment necessary. Any operator who estimates his costs on his existing investment in plant and equipment without a liberal allowance for new capital investment as well as ordinary allowances for repair, maintenance and upkeep, will likely come to grief.

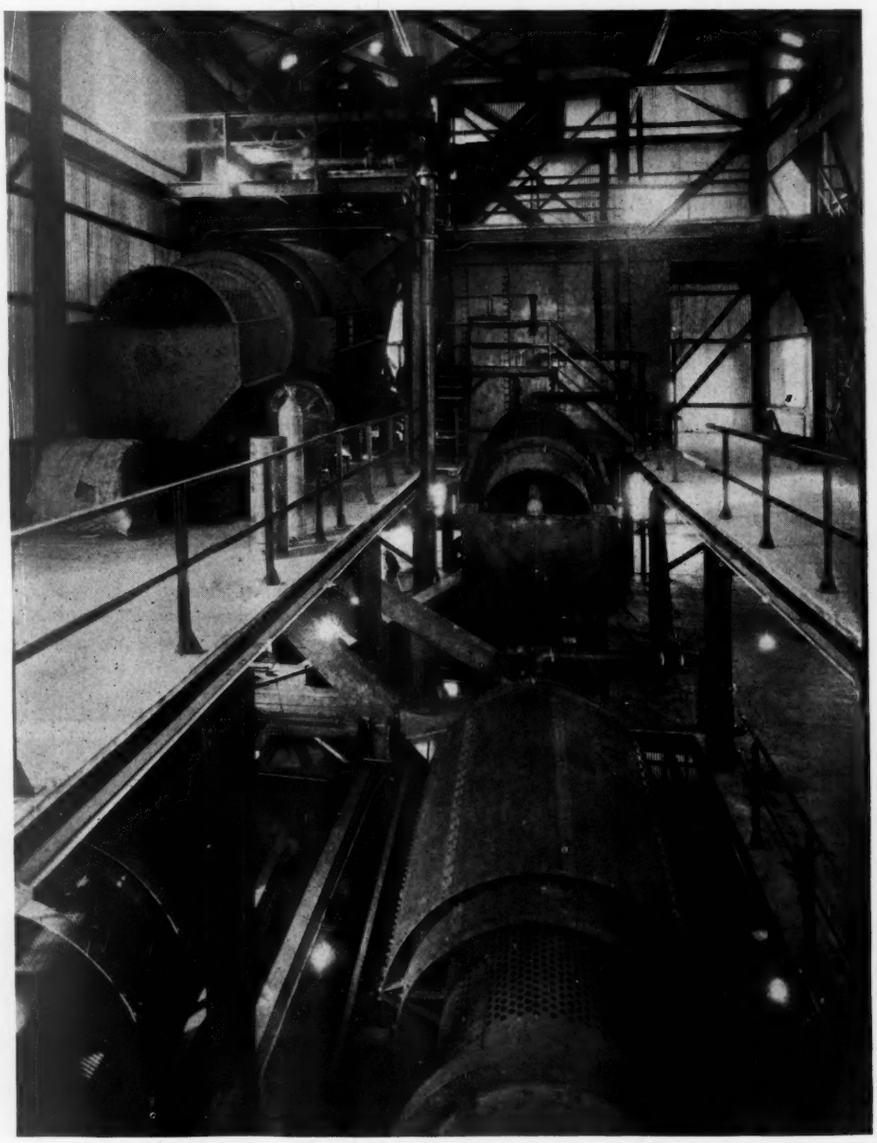
A good example of how an experienced producer keeps a plant up to scratch is the Miamiville plant of the Ohio Gravel Co., Cincinnati, Ohio. This plant was built early in 1929 and in the May 25, 1929, issue of Rock Products we published a complete description of the operation. The plant was then operated by the American Aggregates Corp.

After the Ohio Gravel Co. took over the operation in 1930 it became quite evident that to meet the present specifications in the Cincinnati territory some changes would have to be made in the screening methods. The old plant could meet the Ohio state highway specifications, but to meet the Kentucky specifications changes were necessary; and at the height of the 1931 operating season the old rotary screen that handled the crushed gravel was taken out and replaced with two Niagara vibrating screens. Also the rescreening plant, which had a rotary screen, was replaced with a two-decked, 4-ft. by 14-ft. Niagara vibrating screen.

These changes resulted in a better gradation of the aggregate, saved a total of 40 hp. over the old installation, and makes it possible to ship not only to the Ohio markets but to Kentucky and elsewhere as well.

The sand and gravel is, as formerly, elevated by means of balanced skips that discharge to a steel hopper serving the rotary scalping screen. This screen has 4-in. round perforations. The oversize is chuted to the old gyratory crusher, which is located several floors below the screening plant and in an adjacent building. The minus 4-in. material passes to the double jacketed primary sizing screen. The main barrel of this screen has 1½-in. round perforations and a 4-ft. overhang of 2-in. round perforations. The middle jacket has 1-in. round perforations and the jacket is of ¼-in. perforated metal. The oversize from the inner barrel is chuted direct to a Symons cone crusher, located alongside of the gyratory crusher. The minus 2-in. is chuted to bins or can also be recrushed through the cone crusher if desired. The 1-in. to 1½-in. material retained on the middle jacket and the 1-in. to ¼-in. retained on the outer jacket of this rotary screen fall to bins from which it can be loaded direct to cars or if desired can be rewashed.

Under the old scheme of things this material was elevated to a rotary screen. This screen has now been replaced with the two-decked 4-ft. by 14-ft. Niagara screen previously referred to. A novelty in connection with this long vibrating screen is the method of mounting the lower end; it is suspended from a steel cable that passes up and over a hand winch mounted above in the steel framework of the building, so that if it is desired to change the slope of the screen the change can be readily accomplished. The rewashed stone from this screen, the upper deck of which has 1½-in. wire mesh and the lower deck 1-in. wire mesh, falls to the bins below.



View of screening plant showing revolving screen previously used for crushed gravel, at upper left

Two views in plant showing oxygen and acetylene cylinders at left and portable electric motor driven Alemite gun at right

The two crushers on the lower floor discharge to a horizontal belt conveyor that serves a duplex-lift bucket elevator, which are parts of the original installation. The bucket elevator now discharges the crushed gravel to a 4-ft. by 10-ft. two-decked Niagara vibrating screen, the upper deck of which has a 3½-in. wire mesh screen and the lower deck has 1½-in. mesh. The oversize from the top deck is chuted back to the bins serving the cone crusher. The stone retained on the lower deck can be shipped or recrushed as desired. The original installaton had a 60-in. by 22-ft. rotary screen with two jackets.

The minus 1½-in. material passing the lower deck falls to the third Niagara that is located below. This screen is three-decked and is 3 ft. by 10 ft. The top deck is 1-in., the middle deck ⅜-in. and the lower deck ¼-in. wire mesh. The fines from the lower deck can be wasted or sent to the sand drags.

In replacing the rotary screen with these two vibrators it was necessary to provide a horizontal conveyance to deliver the ⅝-in. to 1-in. crushed gravel to its proper bin, so a Barber-Greene, BG Style U portable conveyor, No. 32-16-46, was installed. This is a 12-in. wide conveyor with sides about 1¼ in. in height.

Another view of the screening plant, showing one of the vibrating screens substituted for the revolving screen

A closer view of the vibrating screen shown on the preceding page

The vibrating screens are each driven by a 7½-hp., General Electric induction motor through a Dayton Cog-Belt drive.

Not only have the specifications for gravel become stricter, but that for sand as well. The state highway department wanted a drier sand, so a 40-yd. Johnson "Octo" bin was installed in the yard alongside the railroad tracks with a Blaw-Knox batcher mounted below. Sand from the bins is loaded to standard-gage gondolas which are stored in the yard until they have thoroughly drained off all excess water, after which the gondolas are spotted at a small track hopper. Under the hopper is a short belt conveyor that delivers the drained sand to a bucket elevator serving the Octobin. In this manner a sand sufficiently dry to meet the requirements is obtained.

Improvements in Lubrication

Also, in 1931, wherever possible the grease cups that were formerly in use were replaced with Alemite-Zerk nipples, and while no accurate records have been kept of the savings in grease or reduction in labor, reduction in power, bearings saved, etc., Frank Boles, superintendent, is more than satisfied as to the economy of this change. He stated that he believed that he reduced the amount of lubricant by about half, and that the labor or time required to properly lubricate was cut at least 66%. As a result of the ease of lubricating a bearing there is far less chance of any being overlooked. A portable electric "gun" is used for most of the nipples.

Under the plant bins are three passageways, two for the railroad cars that are to be loaded, and one for trucks alone. Trucks, however, can load from all three if desired. In the passageway provided for trucks, material for the state highway department is loaded. The state sometimes requires a blended product, and to meet this specification two Blaw-Knox batchers were mounted under the two bins. One of the bins contains the 1-in. to 1½-in. gravel and the other the ⅜-in. to ¾-in gravel. Specifications for blended material to meet intermediate sizes in this extreme of ranges are met by loading trucks from the two batchers.

Bin used to obtain a drier sand

New Lubrication Theory

A NEW THEORY of the mechanism of lubrication as a result of the work of the lubrication engineering committee of the American Society of Mechanical Engineers was presented at an informal conference June 1 at the Engineering Society Building, 29 West 39th street, New York City. The paper was prepared by William F. Parish, chairman of the committee, and Leon Cammen, consulting engineer.

This new theory resulted from discoveries and tests made on a new machine erected by the Sperry Gyroscope Co., which led to a new method of evaluating the lubricating properties of oils and greases. It bears out the discoveries of foreign investigators to the effect that the lubricating properties of oil as such are not determined by its viscosity and that the lubricant is held on the face of the metal by chemical, electrical or magnetic forces.

According to this theory the layer of oil on the surface of the metal pumps oil under high pressure into the crevices of the metal and the surfaces are separated not by the free film of oil but by the layers of lubricant adhering strongly to the metal. As these layers are wiped off by the operation of the bearing they are immediately restored by the oil ejected under enormous pressure from the crevices of the metal. It was discovered that layer after layer may be wiped off down to an ultimate layer which will not come off.

Also, according to the new theory, many if not all, lubricants consist of two parts, one part doing the lubricating and the other acting as a colloidal solvent. Present apparatus for measuring viscosity gives the joint viscosity and not that of the lubricating part, so that it is considered that new methods of determining true viscosity are needed.

Establish Permanent Building Exhibit in England

A NEW permanent building exhibition is to be opened shortly in Bond St., London. It has been organized by the leaders of the architectural profession and building industry to show a complete collection of every commodity considered best in British building material, equipment, and fittings. The exhibit will contain specimens of every sort of marble, both British and foreign, and all manufactured building materials, from foundation to titles. New materials, devices, and decorative ideas will be continually added. It is understood that the whole of the building industry is to be represented and that several thousand firms will exhibit, the Bureau of Foreign and Domestic Commerce reports.

Widening Trend Toward Better Use of Our Great Phosphate Rock Deposits

By H. D. Ruhm
Consulting Engineer, Columbia, Tennessee

AS REFERRED to in annual review in the January 9 issue of Rock Products, the phosphate rock industry is of necessity basic to the fertilizer manufacturing and distributing industry, supplying its chief raw material.

With the enormous holdings of rock deposits entering into the capital structure of the great fertilizer companies, it is obvious that either good or bad conditions in the phosphate rock industry are of necessity reflected sympathetically in good or bad conditions of most of the fertilizer industry.

As the largest present consuming channel of rock phosphate, it is obvious that good or bad conditions in the fertilizer industry are all the more reflected sympathetically in good or bad conditions of the phosphate rock industry.

The full and free development of all possible uses of phosphate rock therefore becomes a matter of vital concern to both these industries, in order to absorb as fully as possible the present great excess capacity for producing phophate rock, beyond the present developed demand.

The largest potential use of phosphate rock should be for direct application to those soils profitably responding with crops having greatest powers for taking their necessary phosphoric acid from the unacidulated phosphate.

Unfortunately, the fertilizer industry for nearly three quarters of a century has looked at such use of phosphate rock only as inimical to a wider use of their mixtures containing the three elements of nitrogen, phosphorus and potash, or so-called complete fertilizers.

In the strong fight waged by the great industry against any development of this direct use of phosphate rock (increased in intensity and retaliative vindictiveness, it is unfortunately true, by an equally improper fight waged by certain proponents of the direct application school on "complete" fertilizers), the chief success attained has been a marked limitation of the use of both these two great classes of fertilizers, to the enormous financial disadvantage and well-nigh ruination not only of both the industries, but also to the great number of farmers who by proper and sufficiently extensive use of both fertilizers might easily be producing farm crops at a sufficiently low unit cost to earn a profit despite the low levels to which world prices of these crops have fallen.

Of the half billion cultivated acres of the United States, easily 20% or 100,000,000 acres could profitably use 400 lb. per acre per year of good grade complete fertilizers, or a consumption of 20 million tons per annum instead of the 5 to 7 million tons of present consumption.

At the same time one-fifth of this same 20% and at least another 10%, or about 70 million acres, could profitably and simultaneously use 1000 lb. of rock or lime phosphate per acre every five years (statement of Prof. S. D. Conners of Purdue University, except as to acreage figures, which are the author's), or 7 million tons per annum of phosphate rock instead of the pitifully small figures of 40,000 to 50,000 tons per annum in use in normal times.

The principal need to bring about this proper development is a discontinuance of spreading abroad the thought that each of these materials is worth buying only if sold at very cheap prices, and education of the farmer user to the realization that the actual value of each class of these materials is far above any price at which either has ever sold, if measured in the lower costs of increased acre yields of higher quality crops produced.

It is therefore well to review the trend of agronomical research, thought and activity; of fertilizer industry's attitude, and of farmer users' advantage, regarding the development of some part at least of this great potential demand for phosphate rock, as intimated would be done in the annual review on this subject in January 9 issue of Rock Products.

There is a general idea that the use of superphosphate for supplementing stable manure is so far superior as to preclude the use of rock phosphate for that purpose, but scientific experiments and practical farmer uses all over the country do not sustain that idea.

The satisfactory results obtained by the comparatively few farmers who have used rock or lime phosphate with stable manure is verified by scientific experiments at many of the agricultural experiment stations.

If the farmers of the corn belt should adopt the practice of supplementing all stable manure with only 40 lb. per ton of rock or lime phosphate, and they secured recorded yields with normal prices, it would mean a profit of from $4 to $6 per year for every 1000 lb. animal stabled, with enormous benefit to agriculture financially; and at the same time a profitable outlet for a large amount of phosphate rock would be provided without injuring the commercial fertilizer business at all.

Considering only the states of Wisconsin, Michigan, Minnesota, Indiana, Ohio, Illinois, Iowa, Missouri, Kentucky, Tennessee, Arkansas, Oklahoma, Mississippi and Alabama, this would mean 50 million dollars per year profit to farmers of those states and would consume 2,400,000 tons of phosphate rock per year or four times

Showing difference in results, using phosphate and lime at right and lime only at left, on Oklahoma farm

the largest total production of the Tennessee field during any of the 37 years since phosphate began to be mined there.

Benefits from this utilization of rock or lime phosphate with stable manure have been shown in experiments in almost every one of the states named above, but it has been impossible to get farmers generally to try it out because of the unfortunate conclusions so widely published from the result of the Ohio experiments, that as long as acid phosphate costs less than $50 per ton a farmer could not afford to use rock phosphate if it were given to him, as Ohio results showed profits of $105 per ton from rock phosphate, but over $165 per ton from acid phosphate.

The well known disagreeable nature of the acid phosphate in handling for the purpose named has prevented any spread of *such* use of *that* material, and Dr. Thorne's statement has been so effectively quoted by opponents as to largely kill the development of such use of rock phosphate, hence neither one has been used with resultant loss to both industries as well as to farmers.

Proper publication of the findings from the other stations would do much to stimulate this great possibility of profit both for livestock farmers of the states named and for producers of finely ground rock or lime phosphate, whose needs are alike so pressing.

Several such findings are in print or ready to be published.

Agronomy Experiments

Favorable results have been noted in experiments at the stations of the following states, determining the value of lime phosphate for fertilizing purposes:

Alabama, Mississippi, Kentucky, Oklahoma, Southeastern Kansas, Iowa, South Dakota, Minnesota, Illinois, Wisconsin, Indiana, Ohio, Pennsylvania, New York, West Virginia, Maryland, North Carolina, Delaware, Rhode Island, Connecticut and Vermont.

Following are some expressions from agronomists from some of those states:

Dr. Horace J. Harper, professor of soils, Oklahoma Agricultural and Mechanical College, Stillwater, Okla.: "A statement might be made that on the phosphorus deficient soils in Oklahoma the use of rock phosphate on non-acid soils has produced marked increases in the growth of sweet clover and on the more acid soils where lime has been applied rock phosphate has also given very excellent increases in the yield of this particular crop. We have no published data available; consequently at this time I do not believe that I could give any specific data to you. I do believe, however, that there is a very excellent opportunity for expansion in this particular territory."

Prof. R. P. Thomas, associate professor soil technology, University of Maryland, College Park, Md.: "There are a few farmers in Maryland who have used your product. As near as I can ascertain, they seem satisfied with the results."

Prof. A. R. Midgley, research agronomist, Agricultural Experiment Station, Burlington, Vt.: "According to the method of Dr. Ford, I find that many of our soils are high phosphate fixers. The superiority of rock phosphate over superphosphate on these soils is yet unknown. However, it would appear as though rock phosphate should have some advantage over superphosphate on these same soils. In the near future, I hope to have more information on this particular problem."

Dr. A. H. Meyer, Soil Investigations, Louisiana State University, Baton Rouge, La.: "We lost our source of phosphorus test the past year. The highway department took over the land immediately after planting on which the phosphorus test was carried on. I hope that we can put this test in another place next year and get more information on the various phosphatic materials."

Dr. M. J. Funchess, dean and director, Alabama Polytechnic Institute, Auburn, Ala.: "We have started some field experiments, but we do not feel justified now in making any statement regarding the results obtained to date."

Prof. G. D. Scarseth, assistant soil chemist, Department of Agronomy, Alabama Polytechnic Institute, Auburn, Ala.: "I am carrying on some investigations on the fixation of phosphates by different types of soil colloids in which phosphate rock is included, and I am sure you will be interested in these results when they are completed."

Prof. J. K. Wilson, professor of soil bacteriology, New York State College of Agriculture, Ithaca, N. Y.: "It is hoped that some time this year I may use some lime phosphate."

Prof. Chas. F. Noll, professor of experimental agronomy, State College, Penn., sent Bulletin 252 to the writer with permission to use any material contained therein; after which the following statement was prepared by the writer: "Bulletin 252, University of Pennsylvania, contains some interesting figures comparing rock phosphate and superphosphate over eight-year trials, in which the ordinary commercial rock phosphate ground for making superphosphate was used and not the more finely ground product. Nitrate of soda was used as the source of nitrogen. On the plots where equal weights of rock phosphate and superphosphate were used the yield from rock phosphate was 92% that of superphosphate in first four years and 81% for the second four years. With finer grinding and sulphate of ammonia as the nitrogen source, equal results should be expected. The bad effect of the nitrate of soda with rock phosphate appears to be cumulative."

This was submitted to Professor Noll for criticism and the following was received from him: "Replying to your letter of December 18, the statement you have in regard to the results secured here with rock phosphate in comparison with 16% superphosphate is correct and yet you may give a wrong impression. The statement that the harmful effects of nitrate of soda with rock phosphate appears to be cumulative is not in the bulletin. That may explain the reason why the rock phosphate did relatively poorer in the second four years than in the first, but that has not been stated in the bulletin. The point I want to make is that this is your conclusion and not the conclusion of the authors of the bulletin. I am wondering if your statement could

Another experiment on sweet clover where lime and potash were used at left and phosphate, lime and potash at right

not be modified to show that this is your explanation of the results."

Of course it was not the writer's intention to attribute the above conclusions to the author of the bulletin in question, the same having been given entirely as his own, and Prof. Noll's correction is quite in order.

Wisconsin

The soils department of University of Wisconsin has under way under **Prof. Emil Truog** a research project now in its fourth year, having for its purpose the study of the fertilizer value, and the most economic and best methods of using lime phosphate.

Report on final results from this work will shortly be made public and will throw a great deal of light on the proper use of this product and will also show the effect of high quality of the rock or lime phosphate used.

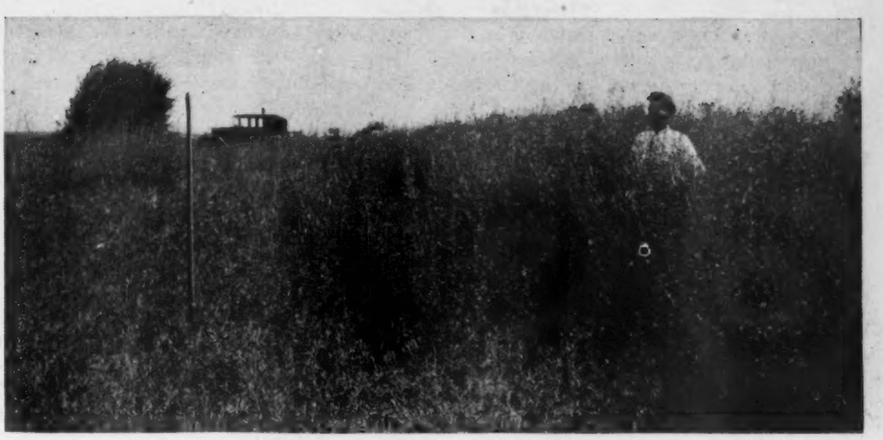
While details cannot be given in advance, it is sufficient to say that largely increased use of this product in Wisconsin has followed the demonstrations given by the experiment.

Another research project under Professor Truog was conducted by **Dr. M. C. Ford,** head of the Ogden Science Department of the Western Kentucky Teachers College at Bowling Green, Ky., with material from the Kentucky Experiment Fields furnished by **Prof. Geo. Roberts** of the Kentucky Experiment Station, in which Dr. Ford has made a complete study of the phosphate rock and superphosphate treated soils, covered by the report published by Prof. George Roberts, June, 1930, in the *Journal of the American Society of Agronomy,* giving the results of a 16-year experiment showing very favorably to rock phosphate.

Dr. Ford's work has been largely to determine the form taken by the large amounts of the respective phosphates applied to these varying soils over this long period and the amount and character of the fixation of the phosphoric acid to forms difficultly available for plant growth.

Two papers covering the first part of his work, which has extended over four years at Wisconsin and is continuing at the Bowling Green Experiment Station, will soon be published in the *Journal of the American Society of Agronomy.* Valuable data are given throwing great light on the proper use of the two phosphates, the question of excessive liming and other important details which seem to answer many questions as to this fixation of soluble phosphates into difficultly recoverable forms.

Dr. Ford's work has resulted in the largely increased use of lime phosphate in Kentucky, and its completion and extension to different soil types will do much to clean up the question of the proper place and method of using this product in all states.



Field on Oklahoma farm showing difference between no treatment at left and lime and phosphate treatment at right

Prof. Truog in collaboration with a number of other state stations is investigating the effect of deficiency of other elements and especially of a proper ratio of soluble calcium to soluble magnesium in connection with both mineral and superphosphate, which appear likely to explain many of the failures of experiments to get good results with rock or lime phosphate.

The following abstract of a paper presented at the November, 1931, meeting of the American Society of Agronomy is quoted from the *Journal of American Society of Agronomy,* page 1076, No. 12, Vol. 23, December, 1931.

"The Nature of Phosphate Fixation in Soils"

(A. Floyd Heck and E. Truog, University of Wisconsin)

"When soluble phosphates are applied to soils, a fixation takes place which results in the formation of phosphates which have a low solubility in water. If there is an abundance of readily available lime present, all or at least a large portion of the phosphate will be fixed as tricalcium phosphate which has a relatively high availability to plants. On the other hand, if the soil is sufficiently acid so that readily available lime is lacking, the phosphate will usually be fixed largely as basic iron and aluminum phosphates.

"Soils of high fixing power, that is, those containing an abundance of readily available lime or certain hydrated oxides of iron and aluminum, fix the soluble phosphates very quickly and, as a result, the downward movement of soluble phosphates applied as fertilizer may be restricted largely to the surface inch or even one-half inch. Soils vary greatly in their rate and character of phosphate fixation. This is a very important factor which should always be considered in phosphate fertilization.

"By means of chemical methods, it is now possible to distinguish, with a fair degree of satisfaction, between the readily and difficultly available phosphorus as well as between soils of low and high fixing power."

The December 19 issue of *The American Fertilizer* contained a paper delivered by **Prof. S. D. Conner,** of Purdue University, at the American Chemical Society meeting in Buffalo, September 1, 1931, which is a most impressive statement of the real situation as to the term "availability" and legal tests therefor, and coming as it does through the official organ of the fertilizer industry, gives momentous evidence of the general trend of the more open-minded members of the industry toward real investigation of the facts, such as Prof. Conners, Prof. Truog and others are conducting.

Here are some of Prof. Conners' statements: "The relative efficiency of different phosphates should be tested by different methods and under different variable conditions before they are evaluated. Crop response is the best measure of the value of a phosphate.

"Composition of the soil as to acidity, lime, iron and other constituents are variable factors in such tests.

"The kind of crops grown in vegetation tests will vary the relative availability of soluble and insoluble phosphates.

"Chemical tests of phosphate availability are necessary but they should be standardized so as to give results similar to crop tests. It may be desirable to report availability of the less soluble phosphates by more than one chemical test.

"Variation in solubility of phosphates has generally been called 'availability.' It is not a good expression when many different variable factors are considered.

"Efficiency may be a better term to use.

"Relative cost of different phosphates is an efficiency factor to be considered.

"The system of evaluating a phosphate from its solubility under one set of arbitrary conditions may therefore fail in giving the true value under other conditions.

"The ammonium citrate method seems to have failed to give true efficiency figures for superphosphates to which ammonia, cyanamid or lime have been added. Perhaps it gives too low results with *most of the less soluble phosphates.*

"Action of insoluble phosphates may be depressed by lime."

From Prof. Conners' data on slightly acid silt loam soil the calculated increases from raw rock phosphate based on water soluble phosphate increases as 100%, show percentages of efficiency with different crops as follows:

Corn 29%, Barley 40%, Wheat 69%, Sweet Clover 91%. Average of all, 57%.

He says: "It would seem that if raw phosphates are used it would be wise to utilize a crop similar in action to sweet clover. Other legumes like red clover and alfalfa would probably be equally as efficient. In a complete rotation of crops a place may be found for a low-priced insoluble phosphate as well as one for a soluble phosphate. The soluble phosphate should be used when a quick start is desired, then it should be applied most efficiently near the seed. The more insoluble phosphate should be mixed so it would come in contact with the soil acids."

And: "If different tests on the availability of phosphates vary so much, how may we know how to judge the kind and quantity of phosphate to use? The answer to this question depends upon the soil, the crop grown and on what other fertilizer materials are used. Soil and fertilizer investigation should be directed toward obtaining such specific information so that phosphates may be intelligently utilized under all variable conditions."

Fineness of Grinding Important with Rock Phosphate

Dr. E. E. DeTurk, Department of Agronomy, University of Illinois: "Our most recent work on solubility studies is of interest in showing that all of the different size grades, so long as they are washed free from dust, are comparatively slow if we compare them with the dust fraction itself. These comparisons are based upon the rate of solubility in a weak solution of acetic acid and not to changes taking place in the soil.

"All of the commercial samples show a rapid solution during the first five minutes, which evidently uses up the dust-like fraction. Afterwards, they all slow up very quickly to a comparatively slow rate of solubility. These are in keeping with the results (which you saw in the greenhouse last summer) where the dust fraction alone showed increase in the growth of wheat and clover considerably in excess of any of the other fine ground material.

"I may say that the finest fraction which we obtained from the Federal Pneumatic Systems in Chicago, who were kind enough to analyze a few samples for us, mechanically, constitutes a degree of fineness that might be a goal for several years, to which anyone with fine grinding ambitions can strive. This material shows approximately 50% finer than one micron and almost 100% finer than five microns."

Foreign Field Experiments

There were two outstanding reports of field experiments during the year which give a practical field test answer to comparative crop response of phosphoric acid from superphosphate and finely ground rock phosphate.

One was bulletin No. 762, December, 1929, of the Minister of Agriculture and Lands, Southern Rhodesia, by A. D. Husband, chief chemist. This was a three-year experiment with maize:

Crop—Maize.
Soil—Red Dolerite loam pH 7.1, unlimed.
150 lb. each of rock phosphate compared with a mixture of bone and superphosphate.

Three-year average increase of maize yield:

Superphosphate and bone	669 lb.
Rock phosphate	835 lb.

Rock phosphate = 125% of mixture.

At price of $25 per ton for each of these products and 37c for corn, the farmer carrying out this result would obtain $7 in return for each dollar invested in the superphosphate and bone and $8.66 for each dollar invested in rock phosphate.

For the three separate years the yields of rock phosphate were the following percentages of those from the mixtures:

First year	87%
Second year	140%
Third year	207%

The other foreign experiment is reported in the 1930 Report of the Rothamsted Experiment Station in England.

Previous experiments with rock phosphates have been with coarsely ground material as used for manufacturing superphosphate.

This experiment is being carried on on the exhausted soil of Rotation I, and the general statement of conclusion is that superphosphate is superior to rock phosphate.

The same amount of phosphoric acid was supplied in each case, by using about half as much rock phosphate as was used of superphosphate.

Sulphate of ammonia was used as source of nitrogen.

Finely ground Gafsa phosphate prepared for sale for direct application was used.

The following figures are calculated from the detail yields given on pages 130 and 131 of the Report for 1930:

Percentage efficiency rock phosphate to superphosphate:

Hay	65%
Wheat grain	120%
Wheat straw	142%
Barley grain	61%
Barley straw	146%
Turnip roots	42%
Turnip tops	46%
Average rock phosphate for grain, hay and straw	131%
Average rock phosphate for turnip roots and tops	43%
Average rock phosphate for all crops	61%

These two experiments add to the evidence that many farmers can best use rock phosphate and many can best use superphosphate, and it should certainly be the job of all to sell the right material to the right farmer and bring everybody out of the slough of despond that has so long been engulfing them.

Views of Others

Prominent parties including bankers and phosphate land owners in the phosphate fields have made the following statements:

1. "I will state that I look for increased demand for phosphate rock as the long stringency passes away; and I think that greater prosperity will follow the stringency than at any period perhaps in our history. I mean that I think substantial prosperity and not sporadic boomlets now and then, will appear.

"While phosphate products in Tennessee are, like almost everything else, on a lower level than formerly, it must not be forgotten that a dollar today is worth more than $2 a few years ago in the purchase of almost any character of merchandise.

"I see more evidences of returning prosperity in the sale of phosphate than for several years past, and a great many think that if Congress leases the Muscle Shoals to private interests that will greatly improve the sale of phosphate property in Tennessee."

2. "We are all much interested in the outcome of Muscle Shoals, as it will help all phosphate owners."

3. "I wish all phosphate owners could be educated to help carry out research as to uses of their product.

"Development of Muscle Shoals will make all our properties valuable."

4. "The present is really the time for capital to take advantage of existing opportunities for acquiring valuable deposits at a small fraction of intrinsic values.

"In my opinion, the practical exhaustion (with one or two exceptions) of the high-grade tonnage at Mt. Pleasant will necessarily result in a gradual transfer of major operations from Maury county to Hickman; and sooner or later we may hope to profit by this development."

5. "The only prospect of a better condition for both the farmer and the phosphate producer is a general curtailment of

the acreage under cultivation, using only the lands best suited for a certain crop, discarding cultivation of all the land which under most favorable conditions will not yield more than 50% of a normal yield, sow this land down in pasture, raise and keep more livestock to preserve and increase the fertility of his farm, then by a liberal application of phosphate to both his pasture land and the many fewer acres under cultivation he will be able to reduce his cost of production to a point where he can successfully meet world competition and regain to a large extent his lost independence and prosperity.

"All the companies in this field have large stocks of washed material on hand and are simply marking time at present, one working two days a week and another three, while three others have closed down their plants indefinitely.

"As to preparation of the product, a real step in advance has been achieved by the I. A. C. in the successful operation of the oil flotation process of cleaning the sand now in use in both their Florida plant and that at Wales, Tenn. By this treatment they are increasing the per cent. of B. P. L. from 5 to 7 points daily. The process is a delicate one but seems to be very successful."

6. **Judge Robert Ewing,** of Nashville, one of the pioneer iron manufacturers of Tennessee and, for 30 years past, chairman of the Agricultural Committee of the Chamber of Commerce of Nashville, who has retained an active interest in the outcome of ideas long ago advanced by him, writes as follows: "Many years ago I experimented on my garden in Wayne county in the use of very finely ground phosphate as a fertilizer and became convinced that that was the cheapest form for the application of this material as a fertilizer of land. I made several shipments of this material in this form to Prof. Cyril G. Hopkins of the University of Illinois, at Urbana. After thorough experimentation, he became convinced of this fact and in a very broad way advised the farmers of the Northwest, whose lands were in need of phosphoric acid, to use this rock in this form without acidulation. I think it highly desirable in the development of Tennessee's mineral wealth that our institutions should have men as instructors capable of making research and turning the minds of students towards making the unique mineral resources of Tennessee helpful to the actual wealth of this state."

From the above it would appear that wider circulation of actual knowledge already possessed and that now being developed by continued experimentation of the United States Department of Agriculture and state experiment stations, as to the proper use of unacidulated phosphate, is all that is necessary to have all farmers avail themselves of the great benefit of such proper use. This would not only relieve the present condition of the great phosphate rock deposits as "frozen assets," and change the depressed condition of the phosphate industry to one of profitable activity, but every dollar of gross sales resulting would be reflected in several dollars profit to the farmer users even with present low prices of farm crops.

Phosphate relief thus appears to be one real tangible means of farm relief.

Thanks are due and hereby accorded to the following who have contributed information used herein:

Prof. S. D. Conners, Purdue University.
Dr. H. J. Harper, Oklahoma Agricultural College.
Dr. A. R. Midgely, Vermont Agricultural College.
Dr. A. H. Meyer, Louisiana Agricultural College.
Dr. M. J. Funchess, Alabama Agricultural College.
Dr. G. D. Scarseth, Alabama Agricultural College.
Prof. J. K. Wilson, Cornell Agricultural Experiment Station.
Prof. Chas. F. Noll, State College, Pennsylvania.
Dr. E. Truog, Wisconsin Agricultural Experiment Station.
Dr. M. C. Ford, Bowling Green, Ky.
Dr. A. F. Heck, Wisconsin Experiment Station.
Mr. A. F. C. Van Den Bergh, Diamond Fertilizer and Chemical Co., London, Eng.
Mr. A. D. Husband, Chief Chemist, Minister of Agriculture and Lands, South Rhodesia.

Investigations of the Canadian Department of Mines

THE ANNUAL REPORT of the testing and research laboratories of the Department of Mines of Canada for 1930 has been issued. Of interest to rock products producers is the report on grinding of scrap mica from the Blackburn mica mine in Papineau county, Quebec. The report discusses grinding with hammer mills, KEK mills, and with the Raymond pulverizer. It also tells of screening. The conclusions state "It would be unnecessary to grind this mica wet. . . . the Raymond pulverizer having the advantage of giving a product containing a lot of fines if desired. The hammer mill has a larger capacity for the horsepower consumed and the value of the machine. . . . A Rotex screen would be suitable for screening the ground mica."

Another report discusses experimental tests on the possible use of dolomitic limestone in the cyanide treatment of Howey gold ore. It was decided that the deposit tested might be used with satisfactory results.

A third report covers the examination of anhydrite from Canadian deposits. From tests it was concluded that plasters could be made from anhydrite by the addition of small amounts of certain chemical salts. Objectionable features are the shrinkage and efflorescence which occur in many cases, but ways to overcome these difficulties are explained.

Electrothermal Production of Phosphoric Acid

IN an article in *Industrial and Engineering Chemistry*, April, 1932, B. G. Klugh, Swann Chemical Co., Birmingham, Ala., tells of some of the problems in connection with the development of the electrothermal continuous process of phosphoric acid production at Anniston, Ala.

Phosphoric acid is commonly produced by smelting phosphate rock with carbon and silica at 1300 to 1400 deg. C., which reduces the natural phosphate to elemental phosphorus; then volatilizing, collecting and hydrating the phosphorus. Carrying on this process in separate steps instead of continuously resulted in easier control but meant greater losses in processing and higher costs. Hence, the development of a continuous process, using the electric furnace.

It is stated that the electric furnace has the advantage of large reserve heat capacity and rapid heat transfer without the large conduction and radiation losses of ordinary fuel-fired furnaces. However, in order to avoid excessive temperatures, it was found necessary to carefully control the depth and resistance of the charge.

There are still a number of practical problems to be solved and it is believed that further economies can be effected.

Liquid Oxygen Explosives

THE use of liquid oxygen explosives (L.O.X.) in blasting is very thoroughly covered in Bulletin 349, recently published by the Bureau of Mines, U. S. Department of Commerce.

The history of its use is given, along with its properties and its application to blasting operations. It was first used in Europe in 1897. In the United States experiments were begun on it in 1917 by the Bureau of Mines and it is now used in this country in various stone quarrying and coal stripping operations.

Details of its use and cost at some of these operations are given and the results of tests made by the Bureau of Mines are also included.

The book contains 82 pages, with illustrations, tables and charts, and may be obtained from the Superintendent of Documents, Washington, D. C.

Feldspar and Salt Production in Canada

Feldspar—Canadian feldspar production in February amounted to 945 tons; in January, 800 tons were produced and in February, 1931, the total was 377 tons, according to a report by the Dominion Bureau of Statistics at Ottawa.

Salt—The February production of commercial salt showed an appreciable advance to 12,477 tons as compared with 9435 tons in January and 10,844 tons in February, 1931.

Economics of the Nonmetallic Mineral Industries*

Part XVI—Overproduction and Excess Plant Capacity

By Raymond B. Ladoo

Recently Manager of the Industrial Commodities Department, United States Gypsum Co.

WHILE WE HEAR MUCH about overproduction there really is very little true overproduction in the nonmetallic mineral industries. What is really meant is excess plant capacity. Few mineral producing industries carry important stocks of either mined raw materials or finished products, except as a seasonal protection. The nature of the industries involved, the adequacy of shipping facilities and the availability of data on consumers' demands makes real overproduction a small factor. Excess plant capacity, however, seems always to be with us, and in recent years has become a greater problem than ever before.

The modernization of plants and processes to reduce costs and obtain better and more uniform products is a big factor in this situation. Often the older production methods called for intermittent processes and utilized small capacity machines, with much hand labor and relatively small investments. It was a simple matter to increase production by adding more men and a few more comparatively inexpensive pieces of equipment. It was also easy to curtail production by laying off men and letting a few units of equipment stand idle.

Most modern production methods call for continuous production, with large, expensive and complicated machines and much conveying equipment, and so on. Perhaps one single machine or series of machines performing various parts of a single manufacturing operation will take the place of a dozen smaller complete units. Perhaps the smallest economically feasible machine may have twice the capacity of the existing series of units. It may need only a quarter of the hand labor and it may cut the costs in half, if worked full time. And that is where the trouble lies. Each plant of the new type will have twice the old capacity, but it must be run to capacity or nearly so in order to get low costs. Likewise the new plant must run continuously or not at all. Production must be curtailed by complete shut-downs for days at a time, rather than by running at part capacity continuously. The low costs attainable by continuous operation tempt every manufacturer to cut prices in order to widen his markets and enable him to run his plant continuously. This tendency has not only made old plants obsolete more quickly but has accelerated the normal trend toward surplus plant capacity.

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Editors' Note

CHANGING CONDITIONS and higher standards of quality have forced producers to modernize their plants and processes, using larger production units. This has resulted in some excess plant capacity, but not to the extent considered by some, because when figuring productive capacity all old and obsolete plants are usually included.

The author holds that plants must be kept modernized and cites the success and profit of new plants in industries which seem overcrowded. Other factors affecting surplus plant capacity and obsolescence, such as changing markets and transportation methods and costs, are also discussed.

The importance to the producer of making new products to meet the customer demand is also emphasized in this concluding article of the series.—The Editors.

When a manufacturer is contemplating modernization of his plant he should figure his costs based on his *present volume* of business (including overhead and all carrying charges during the necessary idle periods) rather than his theoretical costs based on full time operation of the new equipment. If the costs so figured are lower than present costs perhaps the new plant is justified, but not always. There are disadvantages to large scale continuous operations. The smaller intermittent process plant is more flexible. It can easily be adjusted to make up special material to fit a customer's specification. The large modern plant wants to make one or, at most, but two or three standardized products which approximately meet the majority of customers' requirements.

The large modern plant usually represents a very large capital investment compared to that of the older plant of comparable capacity, not only due to more extensive and complicated equipment, but also because construction costs today are much higher than when most of the older plants were built. Higher capital investment means higher indirect charges for interest, depreciation, and so on. It also means that it is much more expensive to let a plant stand idle.

Many companies have found that modernization of their plants has not brought them the economies or profits expected and that it has made more difficult the handling of profitable specialty business. However, the modernization of industries in general must and will continue and in many instances is the salvation of individual companies as well as whole industries. It is worth while, though, to consider both the advantages and disadvantages.

Obsolescence

Another cause of surplus plant capacity which is closely allied to modernization, if not really the same problem, is obsolescence. In figuring productive capacity of the country in any given industry it is customary to include all producing plants and some which are at least temporarily closed down, regardless of age, condition or efficiency. Many companies even after they have built fine, new, modern plants attempt to keep their old plants running as long as possible. Many small companies continue to run obsolete plants long after they have ceased to be profitable if proper accounting systems were used. If all non-profitable plants and all very antiquated and inefficient plants were omitted from summaries of plant capacities, much of the apparent surplus would disappear.

At no two plants in any industry are production costs the same. There is every gradation from very high costs to very low costs. There may be 100% or even 200% difference in cost between the highest and the lowest. At any given price there is a definite volume of business which may be taken at a profit. All production capacity of plants with costs in excess of this price is non-economical plant capacity. In this discussion, of course, costs mean not simple plant costs, but total costs including overhead, sales expense, etc. By the law of supply and demand, as demand increases, prices rise and more productive capacity becomes profitable. Conversely, as demand decreases and prices fall, more plant capacity becomes unprofitable.

Surplus plant capacity may be deliberately created to take care of actual or probable peak demands. Some industries are seasonal, for example the building construction industries, with peak loads in the summer and early fall. To meet the greatest possible demands plant capacities may be increased to a point where a large part of the equipment is idle during half the year. In some industries peak loads may be met by storing finished or partly finished products during the slack months, for example, the storage of finished portland cement and cement clinker during winter months. Other products cannot be stored successfully for long periods, due to deterioration, or to cost of rehandling, or to large amount of storage space required.

Considering the rapid progress of invention by which machines, equipment and methods quickly become obsolete, and the more or less necessary extra plant capacity used for peak loads, the actual surplus economic plant capacity in many industries is not great. In fact in some industries there is an actual shortage of modern, low cost, profitable plant capacity. New plants are continually being built in industries which seem badly overcrowded and such plants often become successful and profitable. In order to keep abreast of competition a company should amortize its plant account at a rapid rate, provide an ample sinking fund for plant improvements, and keep its plant modernized.

Geographical Changes

Another set of factors which cause obsolescence and surplus plant capacity has to do with changes in centers of population, markets, freight rates, transportation methods, etc. In a previous section the influence of transportation on value of deposits has been discussed. The automobile and good roads have changed buying habits, centers of population, market trading centers and so on. In the past twenty years there have been large increases in rail freight rates, not always uniformly but often differentially. By differential changes in freight rates one plant may be moved closer to an important market and another moved further away, in terms of freight cost to reach that market. In a typical example one plant built about 1915 has been successively removed further and further away from the Chicago market by four changes in freight rates until now it has practically lost its Chicago business. New plants built in the Chicago area have made this plant obsolete in terms of ability to reach large markets. This represents surplus plant capacity which is really not obsolete from a mechanical standpoint, but yet is obsolete economically.

Changes in transportation methods, centers of population, and so on have a similar effect on the economic value of a plant. In some sections of the country there is a high concentration of one type of industry, for example the automotive industry in and around Detroit, the shoe industry in Lynn and Brockton, Mass., and cotton textiles in Lowell and Lawrence. A severe, prolonged depression in one of those industries or a change in economic conditions, such as the shifting of cotton textile production to the South, causes important changes in the concentration of population. New plants are built to serve the new, rapidly growing areas and other plants are left with little business, again adding to surplus plant capacity.

New Products and Processes

Not only may a plant be made obsolete by progress within its own industry, but progress and changes in the industries which use its products may have the same effect. A company producing talc may find its major market for talc as a filler in paper. Changes in paper making may result either in the use of no filler at all or in the use of clay. Immediately there is a surplus of talc producing capacity, not because the productive capacity has increased but because the markets have shrunk; unless, by research, new uses for talc have been developed to take the place of the lost markets.

A far sighted and alert company or industry often can see such changes coming and prepare for them. They may be able to improve or change their products so that the old markets will not be lost or they may be continually searching out new uses so as to keep their markets well diversified.

Many, probably most, producers are very reluctant to change their lines and make new products. This is a natural, but often dangerous, tendency. They know how to make one type of product and it requires a lot of time, effort, study and money to get into a new line. Many companies slowly die because of unwillingness to make new products which their trade demands. Satisfied customers are the most valuable assets a company has. It should be the slogan of every company and every industry to follow the customer, whatever his needs. *"Sell the customer what he wants, not what can be made easiest or what you would like to have him buy."* If a customer has been buying talc and he finds he must have clay, get clay for him, either by handling on a commission basis, or by producing it or in some other way, but get it for him. Of course, an effort should be made first to improve the old product to meet the new needs, but if that cannot be done, the new product should be acquired somehow. It is worse than useless to attempt to get a customer to change his process to suit your material, unless you can definitely prove to him he can make a better product at the same cost or as good a product at a lower cost or both. "Educating the trade" is usually a costly and futile undertaking.

This question of meeting the customer's needs and desires is one on which there are usually divergent views within a company. The sales department wants to be able to offer anything a customer wants or thinks he wants, no matter whether it is a standard product or one requiring special preparation. The more grades and types of product a salesman can offer the easier it is to sell. The production department takes exactly the opposite view. They would like to make but one type or at least a few types and grades of a product, in order to get continuity and uniformity of plant operation and lowest costs. Making a lot of special grades means constant changes in processes and in settings of machines, large inventories of finished and semi-finished goods, more types and sizes of containers and so on. The research department may not agree with either side. They may not be so much interested in diversity of grades and types as they are in making an ideally perfect material which may be difficult and costly to make and not easy to sell.

A compromise must be made between these divergent views. It is not profitable to try to make and sell too many types and grades of essentially the same material, yet reasonable needs of the trade must be met. An intelligent salesman will know how far he can go toward persuading a customer to accept a standard product, and when he should call on the production department to make a special product. In the last analysis the views of the sales department must govern, if at all consistent with profitable production. Ability to produce cheaply means nothing if a product is not salable.

Conclusion

An attempt has been made in these articles to emphasize the fact that the nonmetallic mineral producing industries have very definitely emerged from the status of small independent producing units which so largely characterized this group until comparatively recent years. In the whole group of mining industries the metallic mineral producers first came into the ranks of "big business" and began to use large scale, efficient methods in production, organization, research and management. Coal mining somewhat tardily followed and even now is not as efficiently conducted in many areas as it could and should be.

The nonmetallic minerals have very definitely lagged behind and only quite recently have begun to assume their proper position in our industrial scheme. This has been due very largely to the fact that most of the nonmetallic minerals occur in abundance, wide spread over the country. Sand and gravel, limestone, building and ornamental stones, clays and so on, could be easily and cheaply produced locally by small independent producers. Higher standards of quality and uniformity and the demand for large quantities of material for large industrial and building projects eventually forced large scale production and better methods, first in isolated cases and then quite generally. This has gradually set up standards of quality and costs which the old time independent producers could not meet. This new competi-

tion has forced and is forcing a revolution in many of these industries. To meet these changed conditions producers today must take into account the basic economic factors involved in their industries.

Acknowledgments

The author wishes to express his appreciation and thanks to G. P. Seeger and C. H. Shaver for their criticisms and suggestions throughout the preparation of this manuscript. The section on financing of combinations was prepared in part by Mr. Shaver.

Government Tests Find Potash

THE DEPARTMENT of the Interior announces that the Geological Survey has recently completed the study of the cores from the 21st, 22nd and 24th government test holes drilled by the Bureau of Mines under the act which provided for joint explorations by the Department of the Interior and the Department of Commerce in search of potash. The site of the 21st test is in Lea county, N. M.; the 22nd in Eddy county, N. M.; the 24th in Grand county, Utah. The potash-bearing mineral polyhalite was encountered in each test hole; sylvite in the 22nd and 24th, and carnallite in the 21st. No beds of possible commercial interest were penetrated by the 24th test hole; but beds of polyhalite containing 10 to 14% of K_2O (pure polyhalite contains 15.6%) and thick enough to mine were found in each of the other test holes, and in the 22nd test hole a bed of sylvinate (a mixture of NaCl and KCl) nearly 4 ft. thick and containing nearly 18% of K_2O was encountered. This bed is overlain by nearly pure halite, but the underlying beds for about 11 ft., which also consist chiefly of halite, contain from 3 to 3.5% of K_2O. The completion of the 21st test hole, which was drilled out of numerical order, marked the end of the government's five-year program of core drilling for potash, no further funds for the purpose being available.

The Federal five-year program of potash exploration, together with events which preceded it, has stimulated private exploration and actual exploitation of potash salts in the Permian basin of New Mexico and Texas. It has demonstrated the presence of great reserves of polyhalite and of at least one rich body of sylvite in the same general region. By improved methods of study applied to both oil-well cuttings and cores it has outlined a broad area in which sylvite occurs and in which by further exploration additional commercial bodies of that mineral may be found.

The potash possibilities in Utah have not been sufficiently tested, but from the known structural conditions and the results thus far obtained the prospects for commercial potash development in that state would seem to be less favorable than in New Mexico or Texas.

All-Night and Sunday Service Help Sand and Gravel Producer "Make Good"

By Willis Parker

THE DELIVERY SYSTEM of the Service Gravel Co., Riverside, Calif., is based upon the theory that the company's trucks belong to a trucking concern, which, in order to exist, must make a profit on each haul, and that the material is a product which some customer desires moved, according to F. A. Braman, manager. There is no such thing as operating a truck at a loss or applying profits from the material to truck operation deficits. Prices are quoted separately under headings: "Bunker Prices per Ton," and "Hauling per Ton."

However, a truck does not move for less than $2.20, which represents the price charged for moving four tons of material into the first zone. Therefore the person who desires only one ton of material, pays $2.20 for the hauling of it; and this in addition to the price of the material.

The first zone comprises an area within a radius of 5 miles of the plant. Hauls into the second zone are 65c. a ton and those into the third, 75c. Beyond the third zone prices for hauling are quoted separately upon each job.

"It costs us just as much to deliver one ton as it does four, or five, or, in some instances, ten tons," Mr. Braman declared. "This is because our equipment is of large capacity. Six of our trucks have capacity up to 6 tons each; three handle 10 tons. It is obvious that fuel costs for a one-ton approximate as much as for four tons.

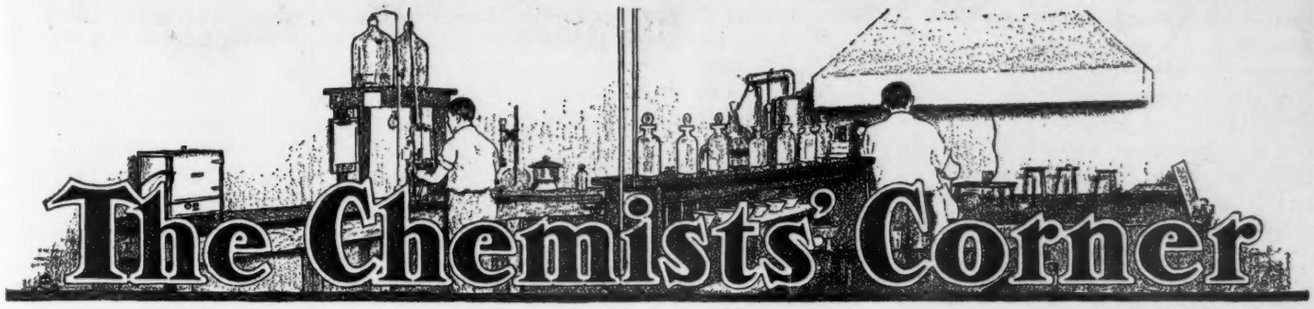
"Our nine trucks represent the amount of equipment we require when our operations are down to a minimum. We hire additional equipment, when it is required, but we pay the outside trucking companies 10c. a ton less than our own delivery prices. This 10c. covers our cost of directing and supervising the activities of the additional equipment, for it is evident that as the volume of deliveries increases extra clerical help will be required. Hence the 10c. covers this overhead expense and leaves us a small profit besides."

Night and Sunday Service

The service is all that the firm name implies, according to Mr. Braman. If a contractor is doing some night work and finds he's running short of material, he may telephone at midnight and it will be delivered, though the plant and delivery system are not functioning. If he is doing Sunday work and needs material, a telephone message will start the delivery fleet going, though it means pulling some of the drivers away from their Sunday holiday activities.

However, wherever it is possible to anticipate contractor requirements, the machinery for distribution is set up to take care of his wants. For example, at the time of this interview the firm had under way one exceptionally large job, which when started in earnest would require more material each day than the plant could produce or the delivery fleet handle. So a bunker was erected near the job at the producer's expense, and for several days, the firm's trucks were occupied with hauling material to it—that is when other jobs did not take their time. A large surplus was thus accumulated; then, when the job got underway, supplies were drawn from the bunker when the demand was greater than could be economically supplied from the main plant.

Loading truck from stockpile with portable conveyor loader



The Recast Analysis and Its Relation to the Chemistry of Portland Cement*

Part I—Recasting Chemical Analyses

By Louis A. Dahl

Research Chemist, California Portland Cement Co., Colton, Calif.

MANY ATTEMPTS have been made to develop mathematical formulæ which will express the "best" composition of portland cement, and may be used as a guide in the control of composition in the manufacture of portland cement, or as a means of computing the correct proportions of raw materials from their known compositions.

In the early days of the cement industry mill chemists relied upon empirical ratios or "moduli" as a means of expressing the relations between components which they desired to attain in controlling composition. Although such ratios have no relation to the compounds which may exist in portland cement, they have performed a good service, and are still in use.

Of late there has been an effort on the part of cement chemists, particularly in Europe, to develop formulæ to replace some of the old ratios as a guide in control of composition. Such attempts are a result of a realization that advances in knowledge of the constitution of portland cement clinker should make it possible to formulate relations which will be of more value than formulæ developed empirically. More attention has been given to formulæ for the purpose of expressing the relation of lime to the other components of cement than has been given to any other relation between components.

This special interest in the problem of securing a proper lime balance is due to the fact that there is an upper limit to the percentage of lime which can be calcined in the manufacture of portland cement, a limit which varies with variations in the relative proportions of the other components. It is generally realized that the empirical ratios which are intended to secure a proper lime balance fail to express the upper limit of lime correctly. With the present tendency to work toward the upper limit of lime in the process of manufacture it is more important than ever before that the formulæ for controlling the lime balance should be scientifically sound.

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Editors' Note

THIS is the first installment of series of articles which brings the operating chemistry of portland cement to date.

There is a wealth of literature on formulae of one kind and another based on ratios for proportioning the components of portland cement, but they are far from correct according to laws of mathematics and chemistry.

Mr. Dahl has really produced a monumental work here, that we feel sure will be welcomed by all cement chemists who are no longer satisfied to get along with the present inexact methods of control.— The Editors.

Most of the efforts to develop new formulæ for expressing the relation of lime to the other components, to be used as a guide in control of composition, or as a basis for computation of compositions, have followed what may be termed a standard procedure. The first step is to develop an equation to express the relation of lime to the other components at the upper lime limit. This may be described as the "saturation point," the "best" composition for portland cement, or some other term, but in any case it is an equation for determining the greatest percentage of lime that theoretically may be present without passing the limits of portland cement compositions, and is based upon some particular theory as to the compounds which may be present in portland cement. Such an equation represents a composition impossible to burn in the ordinary process of manufacture, and so it is necessary to drop back from this composition, and to aim at a lower percentage of lime. The standard procedure is to form an equation in which the ratio of lime to the expression representing the upper lime limit is equated to a constant.

The standard procedure which has been described is not accidental. It is based upon a reasonable assumption that the equation representing a lime balance to be maintained in the control of composition should bear some relation to the theoretical upper lime limit. The assumption that this relation must be in the form of a ratio is purely empirical, and is not based upon scientific considerations. It is a result of the habit which the industry has formed of expressing all relations between components in the form of ratios.

The writer has given considerable attention to the problem of determining the principles governing the control of composition. In the course of this study it has been found that it is not sufficient to determine composition limits from a list of compounds believed to be present in portland cement, but that it is necessary to consider the influence of composition upon the percentage of melt which is formed in clinker during the process of burning.

It has been necessary to follow the course of crystallization in order to find mathematical expressions for the relation between composition and percentage of melt. In all of this work it has been found to be an ad-

vantage to express compositions in terms of theoretical compound composition. The methods by which analyses may be recast into terms of compounds, and the manner in which such recast analyses may be applied to the mathematical analysis of problems pertaining to the course of crystallization, to the relation of composition to percentage of melt, and to problems of proportioning materials form such a large part of this paper, that the choice of title is appropriate.

The principles to be presented are not confined in their application to any theory as to the compounds which may be present in portland cement clinker, and may be applied to any number of components.

Section 1. Recasting Chemical Analyses

As a means of illustrating a method by which equations may be derived for recasting analyses expressed in terms of oxides into terms of compound composition, a three-component system, CaO-Al_2O_3-SiO_2, will be considered, and it will be assumed that the compounds are $3CaO\cdot SiO_2$, $2CaO\cdot SiO_2$ and $3CaO\cdot Al_2O_3$. The problem will be to derive equations for calculating the percentages of the three compounds from the oxide composition.

Let x = per cent. of $3CaO\cdot SiO_2$.
y = per cent. of $2CaO\cdot SiO_2$.
z = per cent. of $3CaO\cdot Al_2O_3$.
a = per cent. of CaO.
b = per cent. of SiO_2.
c = per cent. of Al_2O_3.

The variables a, b and c are related to the variables x, y and z through the fact that each compound contains definite proportions of the oxides. For instance, $3CaO\cdot SiO_2$ contains 73.69% CaO and 26.31% SiO_2. In Table 1 the proportions of the oxides are expressed in terms of fractional proportions (100th of the percentages).

TABLE 1. PROPORTIONS OF THE OXIDES IN THE COMPOUNDS $3CaO.SiO_2$, $2CaO.SiO_2$ AND $3CaO.Al_2O_3$

Oxides	x $3CaO\cdot SiO_2$	y $2CaO\cdot SiO_2$	z $3CaO\cdot Al_2O_3$
a CaO	.7369	.6512	.6227
b SiO_2	.2631	.3488	.....
c Al_2O_3	.....	.....	.3773

In any mixture of the three compounds the per cent. of CaO present in the form of $3CaO\cdot SiO_2$ is 0.7369 times the per cent. of $3CaO\cdot SiO_2$; the per cent. of CaO in the form of $2CaO\cdot SiO_2$ is 0.6512 times the per cent. of $2CaO\cdot SiO_2$; and the per cent. of CaO in the form of $3CaO\cdot Al_2O_3$ is 0.6227 times the per cent. of $3CaO\cdot Al_2O_3$. The total per cent. of CaO is therefore the sum of these values, therefore:

$$0.7369x + 0.6512y + 0.6227z = a.$$

A similar procedure is followed for SiO_2 and Al_2O_3, giving the three equations:

$$(1)\quad \begin{aligned} 0.7369x + 0.6512y + 0.6227z &= a \\ 0.2631x + 0.3488y &= b \\ 0.3773z &= c \end{aligned}$$

It is assumed that a, b and c are known values, found by chemical analysis. The quantities x, y and z are unknown values to be determined by solution of the equations. The number of the equations is equal to the number of unknowns, and the equations can therefore be solved, leading to the solution:

$$(2)\quad \begin{aligned} x &= 4.07a - 7.60b - 6.72c \\ y &= 8.60b + 5.07c - 3.07a \\ z &= 2.65c \end{aligned}$$

The solution may be expressed in the following form:

$$3CaO\cdot SiO_2 = 4.07\ CaO - 7.60\ SiO_2 - 6.72\ Al_2O_3$$

$$(3)\quad 2CaO\cdot SiO_2 = 8.60\ SiO_2 + 5.07\ Al_2O_3 - 3.07\ CaO$$

$$3CaO\cdot Al_2O_3 = 2.65\ Al_2O_3$$

These equations are not chemical equations, but may be read in the following manner, using the first expression for illustration: The per cent. of $3CaO\cdot SiO_2$ is equal to 4.07 times the per cent. of CaO, minus 7.60 times the per cent. of SiO_2, minus 6.72 times the per cent. of Al_2O_3.

The sum of the percentages of the compounds must be equal to the sum of the percentages of the oxides contained in those compounds. This provides a check on the result. If the three equations are added algebraically, it is found that

$$x + y + z = a + b + c$$

Assuming that the compounds named in (3) are the compounds present in three-component portland cement mixtures, it is evident that any composition of the three components which gives a negative value for any one of the equations is not a portland cement composition. These equations consequently serve to define the limits of three-component portland cement compositions, provided that the three compounds are correctly chosen. The third equation is positive in any case, leaving two equations which limit the range of portland cement compositions. If negative values are impossible, and positive values possible, a value of zero represents a limiting composition separating compositions which are in the portland cement range and compositions outside the portland cement range. It should be understood that the portland cement range as considered here is not the range of practical portland cement compositions, but the range of compositions in which the compounds present in portland cement may appear when such mixtures are burned, and cooled so slowly that crystallization is complete. The limiting compositions are found by equating to zero those equations which have negative terms. Let us consider the equation for $3CaO\cdot SiO_2$. Equating the right-hand member to zero:

$$4.07\ CaO - 7.60\ SiO_2 - 6.72\ Al_2O_3 = 0$$

Transposing:

$$4.07\ CaO = 7.60\ SiO_2 + 6.72\ Al_2O_3$$

Dividing both members by 4.07:

$$(4)\quad CaO = 1.87\ SiO_2 + 1.65\ Al_2O_3$$

This equation gives a limiting value of lime in three-component portland cement compositions, subject of course to the correctness of the premises. It does not provide information as to whether it is a maximum value of lime, or a minimum value. Similar treatment of the equation for $2CaO\cdot SiO_2$ leads to the following equation:

$$(5)\quad CaO = 2.80\ SiO_2 + 1.65\ Al_2O_3$$

This equation also gives a limiting value of lime. For any given values of SiO_2 and Al_2O_3 equation (5) is always greater than equation (4). It follows therefore that equation (4) is a lower lime limit, and equation (5) an upper lime limit.

Although a certain set of compounds has been assumed in arriving at these conclusions, it is evident that a similar method may be used for any set of compounds which may be believed to be present. For any set of compounds believed to be present, a series of equations may be obtained for the conversion of oxide composition to compound composition. These equations may be employed to determine the limits of portland cement compositions, by equating to zero all equations which have negative terms. This fact supplies a criterion by which it may be possible to reject some theories of constitution of portland cement clinker. If portland cement compositions exist which are outside of the range of compositions as defined by the equations, there is reason to question the validity of the theory upon which the equations are based.

The fact that the equations which have been found are in a simple form, described mathematically as linear equations of the first degree, is of considerable importance, provided that it can be proved that such equations are obtained for any number of components. Such proof will not be presented here, but it will be suggested to those who are mathematically inclined, and who may wish to test the matter, that the proof may be found by expressing the original equations, corresponding to those in Series 1, in literal form, and then solving by determinants. It will be found that the equations for recasting analyses into terms of compounds are always linear equations of the first degree.

In the solution of simultaneous equations of the type of Series 1, in which the coefficients consist of three or more significant figures, the computations are long and tiresome, particularly in the case of a large number of components. There is also a loss of accuracy as one after another of the variables are eliminated. A shorter and more accurate method will now be presented.

	Mol. Wt.
Let A = moles[1] of $3CaO\cdot SiO_2$ per 100 grams	228.27
B = moles of $2CaO\cdot SiO_2$ per 100 grams	172.20
C = moles of $3CaO\cdot Al_2O_3$ per 100 grams	270.15
p = moles of CaO per 100 grams	56.07
w = moles of Al_2O_3 per 100 grams	101.94
y = moles of SiO_2 per 100 grams	60.06

The chemical formula of each compound indicates the number of moles of the oxides present in one mole of that compound. For instance, one mole of $3CaO\cdot SiO_2$ is composed

[1] A mole is one gram-molecular weight. For instance, the molecular weight of $3CaO.SiO_2$ is 228.27; one mole of $3CaO.SiO_2$ is therefore 228.27 grams.

of three moles of CaO and one mole of SiO_2. Equations may consequently be set up on the same plan as the equations in Series 1, but in molar form. The number of moles of CaO in 100 grams of a mixture is equal to the number of moles of CaO in the $3CaO \cdot SiO_2$, plus the number of moles of CaO in the $2CaO \cdot SiO_2$, plus the number of moles of CaO in the $3CaO \cdot Al_2O_3$. Or,

$$3A + 2B + 3C = p$$

A similar method is followed to obtain equations for x and y, leading to the simultaneous equations,

$$\begin{aligned} 3A + 2B + 3C &= p \\ C &= w \\ A + B &= y \end{aligned} \quad (6)$$

These equations represent the same relations as the equations in Series 1, but are in molar form. The coefficients are small whole numbers, which simplifies the solution of the equations. When a large number of components are involved, requiring a corresponding number of equations, the saving of time and energy is considerable, and the chances of making mistakes are reduced.

The above equations are solved for A, B and C, obtaining the following results:

$$\begin{aligned} A &= p - 3w - 2y \\ B &= 3y + 3w - p \\ C &= w \end{aligned} \quad (7)$$

These equations are in molar form, and must be converted to percentage form. If each term is divided by the molecular weight of the oxide or compound indicated in that term, the resulting equations are in percentage form.

$$\begin{aligned} \frac{A}{228.27} &= \frac{p}{56.07} - \frac{3w}{101.94} - \frac{2y}{60.06} \\ \frac{B}{172.20} &= \frac{3y}{60.06} + \frac{3w}{101.94} - \frac{p}{56.07} \\ \frac{C}{270.15} &= \frac{w}{101.94} \end{aligned} \quad (8)$$

Multiplying each equation throughout by the denominator of the left-hand member,

$$\begin{aligned} A &= \frac{228.27}{56.07}p - \frac{3 \times 228.27}{101.94}w - \frac{2 \times 228.27}{60.06}y \\ B &= \frac{3 \times 172.20}{60.06}y + \frac{3 \times 172.20}{101.94}w - \frac{172.20}{56.07}p \\ C &= \frac{270.15}{101.94}w \end{aligned} \quad (9)$$

Simplifying fractions,

$$\begin{aligned} A &= 4.071\ p - 6.718\ w - 7.601\ y \\ B &= 8.601\ y + 5.068\ w - 3.071\ p \\ C &= 2.650\ w \end{aligned} \quad (10)$$

Expressed in terms of compounds and oxides, the equations may be written as follows:

$$\begin{aligned} 3CaO \cdot SiO_2 &= 4.071\ CaO - 6.718\ Al_2O_3 - 7.601\ SiO_2 \\ 2CaO \cdot SiO_2 &= 8.601\ SiO_2 + 5.068\ Al_2O_3 - 3.071\ CaO \\ 3CaO \cdot Al_2O_3 &= 2.650\ Al_2O_3 \end{aligned} \quad (11)$$

These equations correspond to the equations in Series 3. The advantages of this method are quite evident. The equations in molar form are simple, and easily solved, and the coefficients in the final equations are accurate, because they are calculated directly from the molecular weights.

(To be continued)

Builds Air Conditioned Cement Laboratory in England

A LARGE and well-equipped laboratory for research on cements and concrete products is being constructed at the Building Research Station, near Watford, England, of the Department of Scientific and Industrial Research.

By means of an air-conditioning plant the temperature in all the rooms in the building will be maintained at 64 deg. F., while the relative humidity will be maintained at 65%, except in the chemical laboratories on the first floor, where these factors will be uncontrolled.

On the ground level is the main testing laboratory, which will have a testing equipment to handle full-size reinforced concrete members. Small laboratories open from the main laboratory and from a gallery surrounding it. In these rooms the preparation of the raw materials, the mixing of cement and concrete, the fabrication and storage of test specimens will be carried out under controlled conditions.

These smaller rooms are lined with 3-in. cork and are fitted with control apparatus by which the standard temperature will be automatically maintained within an accuracy of plus or minus 1 deg., while the humidity will be held constant within an accuracy of plus or minus 1%.

One of the smaller rooms is being fitted as a testing laboratory for experiments on shrinkage of concrete under load. The facilities for research available in the new laboratory, as regards control of atmospheric conditions, are in advance of anything of the kind in other countries, the *Contract Journal* reports.

Estimation of Free Calcium Oxide and Hydroxide

METHODS of quantitative estimation of free calcium oxide and hydroxide are discussed in Special Report No. 17 published by the scientific and industrial research department of the British Building Research, London.

Two glycerol extraction methods, a lime solution extraction method, and a calorimeter method are described in detail. The last two are new and one of the glycerol methods includes new variations. The glycerol methods are applicable to unhydrated cements, sand-lime bricks and hydraulic lime. The calorimeter method was devised for hydrated cements and is also applicable to mortars and concrete and possibly to fresh cements. The lime solution extraction method is restricted to lime mortars and hydrated limes.

The bulletin may be obtained from the British Library of Information, 270 Madison Ave., New York.

Talc in Concrete

FRANK R. WICKS, engineer of the Pacific Coast Talc Co., Los Angeles, gave reasons why talc should make a good admixture for concrete in a paper delivered before the 1931 meeting of the American Society for Testing Materials. It is chemically inert; it is water repellant; it has the same volume wet or dry and it has the ability to lubricate due to its natural slip or grease like smoothness. When powdered crystalline talc is added to the mix it seems to temporarily retard or delay the passage of water into the aggregate, leaving a greater portion of the water available for lubrication. After this stage it remains in the concrete as a permanent inert filler.

The crystalline talc which is produced in San Bernardino county, California, is a hydrous magnesium silicate. It contains no free lime or free magnesia and, according to the paper, less than 5% is acid soluble and none of the material is water soluble. It is customarily ground to 99% through 200-mesh, which appears to give best results.

Admixtures are added to concrete to promote workability, to increase strength and to decrease permeability. There is no standard method of measuring workability, but the paper says that the slump is not changed for the same water cement ratio by adding crystalline talc, unless it is slightly decreased. It shows more flow with lean mixes and less with rich mixes than plain concrete. At the same time it is easier to place in the forms.

A report of two tests of permeability is given. One was of a 1-1.97-2.73 mix. The fineness modulus of the aggregate was 5.1 and the water-cement ratio 0.93. To one sample 3% of the weight of the cement of crystalline talc was added. The water leaking through under pressure was 0.179 gal. per sq. ft. per hr. as against 0.241 gal. for the plain concrete. The other was a 1-3.94-3.12 mix, fineness modulus of the aggregate 4.6 and water-cement ratio 1.45. The leakage through the plain concrete was 2.155 gal. per hr. per sq. ft. while with 3% of the weight of cement of crystalline talc added it was only 0.690 gal.

Several tests of strength with various percentages of talc added are given in some detail. In general, the samples with 3% of the weight of the cement gave higher strengths than concrete without talc and with more or less than 3% of talc. In the field the increase of strength has run about 5% but laboratory tests show a greater difference in favor of the talc admixture. Tests on concrete stored in sea water have shown slightly higher strengths for the concrete with talc admixture. The paper says that talc makes concrete more uniform and quotes from an engineering magazine to show this effect in construction.

Hints and Helps for Superintendents

Shielded Arc Used to Repair Kiln

By C .M. Taylor
Vice-President, Lincoln Electric Co.

IMPROVEMENTS in arc welding technique have opened up many new applications of the process in all types of construction, production or repair, an interesting example of which was noted recently at the Trinity Portland Cement Co. of Fort Worth, Tex.

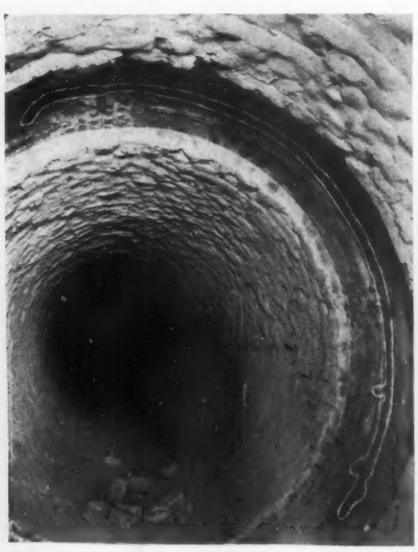
The unit in question was a kiln, 275 ft. long and of 11 ft. 6 in. internal diameter with a shell of ⅞-in. steel plate. Two years ago this kiln, while hot, was cooled too rapidly by a sudden rain squall, causing strains which cracked the shell. The cast steel rings which are riveted to the shell also cracked under the sudden strain.

Efforts to repair this unit with bare electrode were only temporarily successful. Use of the shielded arc process, however, has resulted in what seems to be a permanent repair. Fig. 1 shows the repair as made in the ⅞-in. shell. The weld is 17 ft. 3 in. long and in some places 3 in. wide. About 300 lb. of 3/16- and ¼-in. dia. heavily coated "Fleetweld" electrode were used. The shielded arc process was also used on the steel rings shown in Fig. 2.

The success of this welding process on this application is due to the improved tensile strength and ductility of the metal deposited in a deoxidizing gas, supplied by the burning edges of the special composition coating.

Ductility is as great or greater than mild steel due to the absence of oxides, nitrides and porosity. Elongation of 30% in 2 in. is not a phenomenal record for ductility of weld metal. Tensile strengths average between 65,000 and 80,000 lb. per sq. in., depending upon the application.

Cast steel ring also welded



White line marks weld in kiln shell

Wide Tunnel Entrance

AT the Catsman Sand and Gravel Co. operation at Holley, Mich., two Fruehauf trailers each pulled by a 7½-ton Mack truck are used for hauling sand and gravel from the plant to Flint, Mich., a distance of 17 miles. For loading this truck and trailer concrete silos are provided as well as ground storage.

To load the trucks from the ground storage piles a reinforced-concrete tunnel passes under the length of the stockpile with gates spaced conveniently through the length of the tunnel.

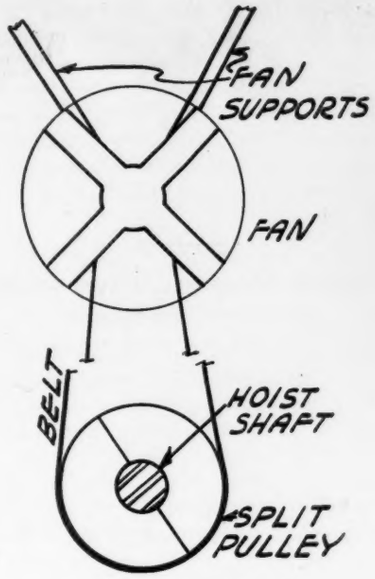
The striking difference between this tunnel and many similar ones in the rock product industries is the wide mouth at the end of the tunnel so that the truck and its two trailers can easily enter or leave the tunnel. The illustration brings out this feature. The tunnel itself is only of sufficient width to conveniently accommodate the width of the truck-train.

Tunnel entrance for trucks with trailers

Fan for the Crane Operator

THE inside of a crane or shovel is generally one place where the breezes do not blow and hence many operators should welcome this idea of a fan installation in the cab for the hot summer days. Such a fan can be readily installed with very little trouble.

Of course each crane will differ in the arrangement of its interior but there should be some position near the operator's seat where a fan can be installed. In the one illustrated the fan was fixed to the ceiling in the middle of the cab. Then a small leather belt was run from the fan pulley down to the hoist drive shaft. To get a satisfactory speed a 6-in. split pulley was added to the shaft. With the shaft turning over at normal speed the fan delivers a good breeze. To stop the fan while the crane is in operation, it is



Fan for crane cab

only necessary to throw the belt off the pulley.

The fan illustrated was an old auto fan which was picked up for a few cents.

Small Loading Bin Operated at Low Cost

PRACTICALLY all sand and gravel produced at the McCook plant of W. B. Hall, Stanton, Neb., passes through a ground storage pile between the screening plant and the loading hopper, making the digging and loading operations independent of one another in spite of the lack of bin storage. This allows additional time for the wet material to drain.

Sand and gravel is excavated from an underwater pit by a Hetherington and Berner pump, mounted with its 50-hp. motor on a float, and is piped to gravity screens on the bank. Some of the product can be chuted immediately from the screens to trucks, but ordinarily it is chuted to the initial pile in front of the plant from which it is spread over the storage area by a small Sauerman drag scraper. The truck-loading hopper, with a capacity of 20 tons, is at the opposite end of the storage pile, and the drag scraper keeps this bin filled as well as dragging material away from the screens. The scraper hoist and operator are located in a tower above the loading bin, overlooking the yard. About 2500 tons are normally stored in the pile.

While furnishing aggregate for concrete paving in McCook last summer the scraper kept nine trucks going, and in one four-day run loaded out a little over 1400 cu. yd. of gravel.

General view of gravel plant of W. B. Hall

Breaking a Tight Joint

SOMETIMES great difficulty is experienced in unscrewing a box and pin joint that has become set tightly or "frozen" together. This often leads to heating it. If you heat the joint do not heat it red hot, and do not heat the box joint, but heat the pin collar until the heat runs up in the pin causing it to lengthen, thus relieving the tension at shoulder. By heating the box it will get tighter unless it is red hot, then the threads warp and the joint is ruined, and must be re-cut. —*Armstrong Driller.*

Barge Protection

BY FAR the greatest tonnage of sand and gravel handled in western Pennsylvania is by barges on the Ohio, Allegheny and Monongahela rivers. During the winter months the upper Allegheny river freezes and when the spring thaw comes, river transportation equipment is jeopardized by the ice.

To protect its floating equipment from ice, the Allegheny River Sand Corp., at its plant at Reesedale, Penn., constructed a heavy reinforced-concrete wing wall at right angles to the shore line. The wing wall acts as a shield behind which the barges and towboats are moored until danger from the ice is over. The downstream wall of this structure is vertical.

Winter shelter for barges

Gravel is carried from plant to storage by dragscraper—then to truck loading hopper, above

Only One Way Out—Sound Public Works!

Stagnation of Industry Waits Upon Bold Plan to Start Spending

(Contributed)

SUMMER is at hand, but the customary seasonal upturn in the construction industry is not. The curve of business activity is at its depth, unemployment increases and to many the future offers no assurance. Jobs—thousands upon thousands of jobs—are the need.

Little criticism is to be found with the Federal Government's corrective measures of one kind and another applied up to this time; but there is a thoroughly unsound idea now advanced which says "All public spending must cease," irrespective of its economic importance as a public investment or a means of providing employment or of its social value in avoiding the dole or even of its insurance value in preventing anarchy.

"Wise spending, not ruthless and hysterical slashing of all public expenditures is essential if the country is to strike a stride upward from depression." This message, carried in a recent issue of a widely-read Ohio daily newspaper, appeals as native common sense. Its plain statement of sound economy may be measured by the yardstick of pure logic or reached by the process of elimination of other competing notions—it will stand every test.

It is unfortunate that in speaking of public expenditures distinction is seldom made between moneys currently appropriated for the routine of government and outlay for necessary or dividend-paying public works. The first type of expenditure carries along today a burden of millions wasted outright or spent for unnecessary or duplicated functions of government; the second type we believe, carries the key to the only plan by which America may climb out of the depression with reasonable rapidity.

Construction is particularly well adapted for use in taking up periods of slack. Rome built aqueducts and at the same time assimilated the excess labor of her returning legions; bishops and priests of the middle ages similarly occupied returning crusaders with the building of cathedrals, both examples of outstanding public works.

Private construction work of many descriptions is stagnated in thousands of communities and in others it is moving at a pace which is almost negligible. Nowhere is there a present or prospective volume of such work large enough to warrant dependence on it as a means of climbing back to a normal economic condition.

Professor Edwin Seligman, economist, Columbia University, gives the following very plausible explanation for the difficulty in actuating private industrial enterprises:

"I doubt whether even if capital were made entirely costless—that is, if the discount rate were reduced to zero—the wheels of industry would be set in motion again at once. The industrialist today is more anxious about a possible market for his goods than the cost of producing those goods.

"What we need, therefore, is not simply more available credit, although that is good so far as it goes, but the actual setting of the wheels of industry into motion. I do not see how there is any other recourse at present, except a program of government outlay on a large scale."

Everything considered, an expanded program of needed and money-saving public works offers the greatest probabilities for a reasonably prompt recovery from the present business stagnation. The present volume of public work is not inflated. Badly needed bridge structures in this country would alone produce a total of over half a billion dollars worth of profitable building. Sanitary improvements, including sewage treatment plants needed in thousands of communities to safeguard public health against existing menaces and to save profitable fisheries from extinction, will demand expenditures during the next few years that will probably exceed a billion of dollars. Even where great state systems of highways have been built, congestion in metropolitan and suburban areas is still tremendous. To improve present dilapidated state highways within city limits alone would require worthwhile expenditure of 200 million, while to complete the state road systems of the country (including only the much-traveled main trunk highways) at the present rate, would require approximately 30 years.

In restoring buying power, public construction is especially important because it is the only practicable major activity which creates a wage fund without at the same time creating more goods to be purchased. Let a manufacturer double his operations in order to double the wage volume; then he produces twice as much goods that must be bought and he must offer them on an already-glutted market, probably driving price levels still lower. Public construction on the other hand produces no ill effect on any immediate market.

America has come to the point where she must place her hopes of early recovery on sound (self-liquidating!) public works. Most of us would rather see privately managed industry lead in the restoration, for that would be far preferable, if it were possible within reasonable limits of time; but as matters stand, it seems to be either public works or the demoralizing and un-American dole—even though some still refuse to call it by that name.

Predicts Increased River Shipments of Limestone

TRANSPORTATION of limestone on the Allegheny river will nearly equal that of coal carried on the Monongahela river if Congress permits the building of two additional locks and dams on that stream as planned by United States engineers. The contemplated structures would increase slack-water navigation to the upper limits of limestone deposits and permit concerns to move this commodity by river.

Plans are under way to bring additional cargoes of limestone out of the eight pool for steel concerns on the Ohio river. As a result of the opening of the limestone trade during April the Allegheny tonnage for that month was 172,472, as against 71,615 tons in March.—*Pittsburgh* (Penn.) *Post-Gazette.*

Council Opposes Foreign Cement on City Project

NEGOTIATIONS by the Merritt-Chapman-Scott Co., San Pedro, Calif., construction concern, to purchase cement in a foreign country for erecting the new Stockton municipal deep water terminals were rapped in a resolution adopted by the city council recently.

Councilman Wheeler said he had learned that the firm was negotiating to buy Belgian cement for the docks. He introduced a resolution urging the contractors to buy building materials produced in California or "at least in the United States."

B. F. Baum, superintendent of construction, refused to deny or confirm that the concern intends to purchase its cement abroad.—*Stockton* (Calif.) *Record.*

Senate Rejects Phosphate Tariff

THE SENATE has refused to broaden the tariff provisions of the revenue bill to add an import tax of 8c. per 100 lb. of phosphate rock.

Urging the proposal, Senator Fletcher emphasized that the levy would not apply to phosphates used for fertilizers, but only to those used in the chemical industry.

"The principal threat to American phosphates," Senator Fletcher said, "is the French protectorate of Morocco." There, he said, phosphates are produced by Arab labor paid 25c. a day under a government monopoly.—*Jacksonville* (Fla.) *Times-Union.*

Editorial Comment

New Taxes and the Rock Products Industry

In spite of the fact that the rock products industry has been relieved of a general sales tax, or manufacturers' excise tax, by the new legislation to balance the national budget, it certainly will contribute its share and more to make up the billion dollar a year deficit of the United States Treasury; and the increased costs of production thus brought about will not be so easily appreciated and passed on to the consumer, as would have been the case with a general sales tax. There are, however, some redeeming features in the new tax law, at least in so far as these particular construction materials industries are concerned.

The increased taxes on individual incomes affect us all, of course, as individual tax payers, but one of the best arguments used against higher income taxes by those who opposed them was that it would drive investment money into tax-free securities and thus encourage the issuance of these securities by municipalities, counties, states and the nation. As the proceeds of the sale of such securities are ordinarily used for highways and other public works, the producers of rock products construction materials will ultimately profit from such use of investment money, if the contention be true.

There seems to have been little doubt that the bulk of business sentiment was much in favor of a general sales tax, or general manufacturers' excise tax, but obviously popular sentiment was all in favor of high taxes on incomes. So few men who work for a living now have large incomes, as individuals we probably shall not worry much about the increases until business picks up—and it is hoped our incomes, too. And the same applies to the increase in corporation income taxes; few rock products producers' incomes will suffer much this year on that account, except through the new rules covering deduction of capital losses.

The tax of 2% on motor trucks and 3% on automobiles will of course add that much to the purchase price of these necessities to rock products producers after June 21. The tax of 2½c. per lb. on tires and tubes will add to the cost of operating motor vehicles, as will also the 1 cent per gallon tax on gasoline, and 4 cents per gallon on lubricating oils. In the case of lubricating oils something like 12,000,000 gal. are used annually in the plants of the rock products industries, which at 4 cents per gal. amounts to $480,000. This tax may be avoided, apparently, by using greases wherever possible. How the dividing line between grease and oil will be determined remains to be seen.

The most important feature of the new tax bill as affecting costs in the rock products industry is undoubtedly the 3% tax on electrical power, for the rock products industry is notoriously a large user of power. Estimates of power consumption in this industry vary, probably a figure of 5 billion hp.-hours per annum is a good conservative estimate. In terms of kw.h. this is in round numbers 4 billion and at a price of 2 cents per kw.h. the total power bill of the industry is about $80,000,000 annually. A tax of 3% amounts to $2,400,000.

While the above figure, we believe, is conservative, it does include those plants which produce their own power, so perhaps it should be reduced by 25% to cover such home-made power and power from other types of prime movers. The new tax is sufficient, no doubt, to give increased impetus to the use of Diesel engines and other types of plant power where new plants or new power equipment are under consideration. However, the tax is specifically limited to two years' application. Incidentally, this illustrates some of the many inequities of the new tax bill, in penalizing the users of purchased power and the users of gasoline-driven locomotives and motor trucks as compared with those who make their own power or use steam, Diesel, or electric locomotives (driven by home-made electricity).

The real significance of the tax on power is better appreciated by an example of its effect on a single typical operator—a cement manufacturer for example. The average power required to make a barrel of cement is 18 kw.h. A two-kiln plant making 2500 bbl. per day or 75,000 bbl. per month would use 1,350,000 kw.h. per month. Assuming 1 cent per kw.h. (cement mills frequently get lower rates than other rock product industries), this is a monthly power bill of $13,500. A 3% tax means $405 per month operating handicap for the manufacturer who buys power.

With many rock products plants operating irregularly, as at present, the power cost increases disproportionately per unit of product, because of the "stand-by" factor in the power rate—in some instances constituting 50% of the power company's bill—again enhancing the advantage of the manufacturer who makes his own power.

In common with all industry the taxes on telephone, telegraph and cable messages will add appreciably to the costs of doing business, as will also the increase in first-class postage from 2 to 3 cents. Then there is the 2-cent tax on bank checks, drafts and similar paper, which was opposed because it would discourage the use of checks for payrolls, and add to the risk of payroll robberies.

It seems obvious that all these increases in the costs of doing business, in many cases now being done unprofitably, must be compensated for by substantially increased prices of the commodity produced. Unquestionably, one of the most favorable things that can happen in this as well as other industries is a stiffening of prices to cover costs; and if the increased taxes to balance the national budget are used as a lever by producers to increase the prices of their commodities to balance their own budgets, the new taxes can be made to render real service in the recovery of all business, aside from restoring confidence.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	6-15-32	92	98	
Alpha P. C. com.	6- 9-32	6	6⅝	25c qu. Apr. 25
Alpha P. C. pfd.	6- 9-32	80	90	1.75 qu. June 15
Amalgamated Phosphate Co. 6's, 1936[19]	5-28-32	85	90	
American Aggregates com.[19]	6-11-32	1	3	
American Aggregates pfd.[19]	6-11-32	5	15	1.75 qu. Jan. 1
Amer. Aggr. 6's, w.w.[19]	6-11-32	25	35	
Amer. Aggr. 6's, ex.w.[19]	6-11-32	23	33	
Amer. L. & S. 1st 7's[27]	6-15-32	70	80	
American Silica Corp. 6½'s[20]	6-15-32	No market		
Arundel Corp. new com.	6-10-32	18	Act. sale	75c qu. Apr. 1
Bessemer L. & C. Class A	6-14-32	.....	4	
Bessemer L. & C. 1st 6½'s[4]	6-10-32	7	13½	
Bloomington Limestone 6's[27]	6-15-32	.....	20	
Boston S. & G. new com.[37]	6-10-32	3	5	15c qu. Apr. 1
Boston S. & G. new 7% pfd.[37]	6-10-32	20	25	87½c qu. Apr. 1
California Art Tile, A	6-10-32	1½	4¼	
California Art Tile, B[9]	6- 9-32	.....	5	
Calaveras Cement com.	6-10-32	⅛	2	
Calaveras Cement 7% pfd.	6-10-32	.....	70	1.75 qu. Apr. 15
Canada Cement com.	6-13-32	2½	3½	
Canada Cement pfd.	6-13-32	21½	Act. sale	1.62½ qu. June 30
Canada Cement 5½'s[42]	6-10-32	67	70	
Canada Crushed Stone bonds[42]	6-10-32	60	70	
Canada Crushed Stone com.[42]	6-10-32	1	.....	
Certainteed Products com.	6-14-32	1	1¾	
Certainteed Products pfd.	6-14-32	6	8	1.75 qu. Jan. 1
Certainteed Products 5½'s	6-15-32	29	Act. sale	
Cleveland Quarries	6-14-32	.....	54	10c qu. June 1
Consol. Cement 1st 6½'s,'A[44]	6-15-32	3	7	
Consol. Cement notes, 1941[27]	6-15-32	No market		
Consol. Cement pfd.[27]	6-15-32	.....	45	
Consolidated Oka Sand and Gravel (Canada) 6½'s[12]	6-10-32	70	80	
Consolidated Oka Sand and Gravel (Canada) pfd.[42]	6-10-32	.....	40	1.75 qu. Oct.10,'31
Consol. Rock Prod. com.[35]	6- 9-32	10c	20c	
Consol. Rock Prod. pfd.[35]	6- 9-32	35c	65c	
Consol. Rock Prod. units[35]	6- 9-32	½	1½	
Consol. S. & G. pfd. (Can.)	5-27-32	.....	50	1.00 qu. May 16
Construction Mat. com.	6-14-32	.....	2	
Construction Mat. pfd.	6-14-32	.....	2½	
Consumers Rock and Gravel, 1st Mtg. 6's. 1948[35]	6- 9-32	31	34	
Coosa P. C. 1st 6's[23]	6-10-32	15	30	
Coplay Cem. Mfg. 1st 6's[23]	6-10-32	60	.....	
Dewey P. C. com.[47]	6-15-32	65	75	
Dolese and Shepard	6-15-32	14	16	$1 qu. Jan. 1
Dufferin Pav. & Cr. Stone pfd.[42]	6-10-32	.....	20	1.75 qu. Apr. 1
Dufferin Pav. & Cr. Stone com.[42]	6-10-32	.....	5	
Edison P. C. com.[19]	5-14-32	.....	16	
Edison P. C. pfd.[19]	5-14-32	.....	25	
Federal P. C. 6½'s, 1941[19]	5-28-32	35	45	
Giant P. C. com.[2]	6-10-32	1	5	
Giant P. C. pfd.[2]	6-10-32	.....	17	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd...	6-13-32	2	2½	10c qu. Oct.5,'31
Gyp. Lime & Alabastine 5½'s[42]	6-10-32	40	50	
Hermitage Cement com.[11]	6-11-32	5	10	
Hermitage Cement pfd.[11]	6-11-32	20	30	
Ideal Cement 5's, 1943[20]	6-11-32	80	85	
Ideal Cement com.[20]	6-11-32	9	12	50c qu. Apr. 1
Indiana Limestone units[27]	6-15-32	No market		
Indiana Limestone 6's	6-10-32	5¾	10	
International Cem. com.	6-14-32	5	5¾	50c qu. Mar. 31
International Cem. bonds, 5's	6-14-32	48½	Act. sale	Semi-ann. int.
Kelley Is. L. & T. new stock	6-14-32	.....	8	25c qu. Apr. 1
Ky. Cons. Stone com.	6-13-32	.....	2	
Ky. Cons. Stone pfd.	6-13-32	.....	50	
Ky. Cons. St. 1st Mtg. 6½'s[45]	6- 9-32	15	20	
Ky. Cons. St. V. T. C.[45]	6- 9-32	½	1	
Ky. Rock Asphalt com.	6-13-32	1¾	2½	
Ky. Rock Asphalt pfd.	6-13-32	20	25	1.75 qu. Dec.1,'31
Ky. Rock Asphalt 6½'s	6-13-32	.....	70	
Lawrence P. C.	6-13-32	6	9	
Lawrence P. C. 5½'s, 1942	6- 9-32	25	35	
Lehigh P. C. com.	6-14-32	4½	5	
Lehigh P. C. pfd.	6-14-32	48⅝	50	1.75 qu. July 1
Louisville Cement[7]	6-10-32	60	80	
Lyman-Richey 1st 6's, 1935[13]	6-10-32	60	.....	
Marblehead Lime 6's[14]	6-10-32	No market		
Marbelite Corp. com.[35] (cement products)	6- 9-32	3c	.....	
Marbelite Corp. pfd.[35]	6- 9-32	30c	.....	
Marquette Cem. Mfg. 1st 5's, 1936[46]	6-15-32	70	.....	
Marquette Cem. Mfg. 1st 6's, 1936[46]	6-15-32	80	.....	
Material Service Corp.	6-14-32	.....	10	
McCrady-Rodgers 7% pfd.[22]	6- 9-32	30	35	87½c qu.Dec.30,'31
McCrady-Rodgers com.[22]	6- 9-32	5	10	75c qu. Jan. 26
Medusa P. C. pfd.[47]	6-15-32	45	55	1.50 qu. Apr. 1
Medusa P. C. com.	6-14-32	4⅝	5	
Monarch Cement com.[47]	6-15-32	45	55	
Michigan L. & C. com.[6]	6-11-32	45	.....	
Missouri P. C.	6-14-32	5	.....	25c qu. Jan. 30
Monolith Portland Midwest com.[9]	6- 9-32	40c	60c	
Monolith P. C. com.[9]	6- 9-32	½	1	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	6- 9-32	1.12½	2	40c s.-a. Jan. 1
Monolith P. C. units[9]	6- 9-32	2¾	5	
Monolith P. C. 1st Mtg. 6's[9]	6- 9-32	55	60	
National Cem. (Can.) 1st 7's[27]	6-15-32	80	90	
National Gypsum A com.[27]	6-15-32	½	1½	
National Gypsum pfd.[27]	6-15-32	20	25	1.75 qu. July 1
National Gypsum 6's[8]	6-15-32	50	55	
Nazareth Cement com.[25]	6-10-32	3	.....	
Nazareth Cement pfd.[25]	6-10-32	45	.....	
Newaygo P. C. 1st 6½'s[27]	6-15-32	71	.....	
New England Lime 6's, '35[14]	6-10-32	No market		
N. Y. Trap Rock 1st 6's	6-11-32	52½	Act. sale	
N. Y. Trap Rock 7% pfd.[30]	6-13-32	.....	35	1.75 qu. Apr. 1
North Amer. Cem. 1st 6½'s	6-11-32	12½	Act. sale	
North Amer. Cem. com.[27]	6-15-32	.....	3	
North Amer. Cem. 7% pfd.[27]	6-15-32	2	4	
North Shore Mat. 1st 5's[18]	6-15-32	30	.....	
Northwestern States P. C.[47]	6-15-32	23	26	
Ohio River S. & G. com.	6-13-32	.....	8	
Ohio River S. & G. 7% pfd.	6-13-32	.....	98	
Oregon P. C. com.[9]	6- 9-32	8	12	
Oregon P. C. pfd.[9]	6- 9-32	80	85	
Pacific Coast Aggr. com.[40]	6- 9-32	.....	½	
Pacific Coast Aggr. pfd.[40]	6- 9-32	.....	1	
Pacific Coast Aggr. 6½'s, 1944[5]	6- 9-32	14	16	
Pacific Coast Aggr. 7's, 1939[5]	6- 9-32	2	4	
Pacific Coast Cement 6's[5]	6- 9-32	50	.....	
Pacific P. C. com.	6-10-32	3	6	
Pacific P. C. pfd.	6-10-32	.....	48	1.62½ qu. Apr. 5
Pacific P. C. 6's	6-10-32	.....	94	
Peerless Cement com.[1]	6-11-32	10c	25c	
Peerless Cement pfd.[1]	6-11-32	1	2¼	
Penn.-Dixie Cement com.	6-14-32	½	¾	
Penn.-Dixie Cement pfd.	6-14-32	3¼	5⅛	
Penn.-Dixie Cement 6's	6-14-32	30½	Act. sale	
Penn. Glass Sand Corp. pfd.[19]	5-14-32	60	70	1.75 qu. Apr. 1
Penn. Glass Sand Corp. 6's	6- 9-32	75	85	
Petoskey P. C.	6-14-32	1	1½	
Port Stockton Cem. com.[9]	6- 9-32	No market		
Riverside Cement com.[9]	6- 9-32	.....	12	
Riverside Cement pfd.[9]	6- 9-32	55	60	1.50 qu. Feb. 1
Riverside Cement, A	5-26-32	.....	8	
Riverside Cement, B[9]	6- 9-32	70c	1	
Roquemore Gravel 6½'s[17]	6-10-32	75	85	
Sandusky Cement 6½'s, 1932-37[19]	5-14-32	80	90	
Santa Cruz P. C. com.	6-10-32	.....	50	$1 qu. Apr. 1
Schumacher Wallboard com.	6-10-32	1.05	.....	
Schumacher Wallboard pfd.	6-10-32	.....	16	50c qu. May 15
Signal Mt. P. C. pfd.[47]	6-15-32	2	5	
Southwestern P. C. units[26]	6- 9-32	200	.....	
Standard Paving & Mat. (Canada) com.[42]	6-10-32	1	2	
Standard Paving & Mat. pfd.[42]	6-10-32	.....	29	1.00 qu. May 16
Superior P. C., A[9]	6- 9-32	23	27	27½c mo. June 1
Superior P. C., B[9]	6- 9-32	4	5¼	12½c Mar. 21
Trinity P. C., units[47]	6-15-32	20	25	
Trinity P. C. com.[47]	6-15-32	3	5	
Trinity P. C. pfd.[47]	6-15-32	18	23	
U. S. Gypsum com.	6-14-32	12¼	13	40c qu. June 30
U. S. Gypsum pfd.	6-14-32	87	95	1.75 qu. June 30
Wabash P. C.[21]	5-27-32	6	8	
Warner Co. com.[16]	5-27-32	1¾	2	25c qu. Oct.15,'31
Warner Co. 1st 7% pfd.[16]	5-27-32	30	50	1.75 qu. Apr. 1
Warner Co. 6's, 1944, with war..	6-10-32	.....	55	
Whitehall Cem. Mfg. com.[30]	6-13-32	.....	80	
Whitehall Cem. Mfg. pfd.[30]	6-13-32	.....	55	
Wiscon. L. & C. 1st 6's, '33[15]	6-15-32	30	.....	
Wolverine P. C. com.	6-14-32	.....	3¼	15c qu. Nov.15,'31
Yosemite P. C. A. com.[9]	6- 9-32	1	1½	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Wick & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central-Republic Bk. & Tr. Co., Chicago. [16]G. M. P. Murphy & Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]Howard R. Taylor & Co., Baltimore. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher-Newton & Co., Denver. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomson & Co., Toronto. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky. [46]First Union Trust & Savings Bank, Chicago. [47]Anderson Plotz and Co., Chicago, Ill.

Kelley Island Lime and Transport Co.

THE annual report of George J. Whelan, president of the Kelley Island Lime and Transport Co., Cleveland, Ohio, contains the following philosophic comment in addition to statistics:

"Any predictions as to the immediate future would, in the light of the past two and one-half years, be presumptuous, especially since those who devote all of their time to forecasting business, and have all available data on which to base their conclusions, have practically ceased making predictions. However, there are factors that will ultimately make themselves felt. Authorities state that the normal building requirements of the country for living quarters is 400,000 units per year. This average was approximated during the 10-year period ending with 1929, which was after the shortage created by the practical cessation of this type of construction during the war. In 1930 and 1931 such construction fell far short of the normal requirements and in this period we have accumulated a shortage of something like a full year's requirements. 1932 has started off very much lower than 1931, and by January 1, 1933, the shortage that will have accumulated will be greater than at any previous time, and we believe that the law of averages will assert itself and bring about a tremendous volume of building to make up the shortage. At that time our products will share in the demand that will be created for building materials.

"The volume of tonnage available in 1931, of which we continued to hold our normal share, was so low that production costs were difficult to control. Adjustments have been made resulting in substantial savings in overhead and other expenses, but even with these adjustments the production costs, coupled with the very low selling prices, precluded the possibility of any real profits. However, on account of the very strong financial position of our company, which has been well maintained, we were able to continue payments of dividends, although at reduced rates.

"While as yet there is no real evidence of any favorable change in general conditions, we feel that any substantial change will have to be towards an improvement rather than otherwise. Our confidence in the future of our country has not been shaken by the events of the last two and one-half years and we have taken advantage of the present low cost of construction by providing additional plant and equipment for the manufacture of new products for which we have already developed a substantial tonnage. A new dock has also been opened at Ashtabula, Ohio, for the handling of sand, crushed stone and other of our products, and this dock, together with our other docks located on Lake Erie, will give us a well rounded out group of points for the distribution of our products to available markets at the lowest freight rates.

"As in the case of many very good companies, the market value of our company's issue of stock has recently been depressed to a point that has no relation to the real value behind the security. Our company has no funded debt or short term indebtedness nor any obligations or issue of securities of any kind ahead of the common stock. The financial statement indicates a 15 to 1 ratio of quick assets to quick liabilities, yet the recent sales of small lots of stock would place a total value on the company of only approximately the amount of the surplus, and little more than the amount of cash and government securities owned."

BALANCE SHEET OF THE KELLEY ISLAND LIME AND TRANSPORT CO.
(As of December 31, 1931)

ASSETS

Current:			
Cash		$1,714,899.02	
U. S. Government securities at cost	$536,415.00		
(Indicated market value, $491,018.30)			
Accrued interest on securities	5,345.63	541,760.63	
Notes, acceptances and accounts receivable	303,679.22		
Less: Allowance for doubtful, etc.	20,000.00	283,679.22	
Inventory (certified by management)		671,618.06	
Dividend receivable (received January 2, 1932)		20,000.00	$ 3,231,956.93
Investments in stocks and bonds, etc., at cost			408,492.64
Other assets, miscellaneous receivables, etc.			121,623.64
Permanent:			
Land, buildings, machinery and equipment, less allowance for depletion and depreciation			6,629,180.36
Investment in subsidiary companies			403,372.00
Insurance reserve funds:			
Cash		$ 190,999.40	
U. S. Liberty bonds, at cost		70,000.00	260,999.40
(Indicated market value, $67,388)			
Deferred			14,073.89
			$11,069,698.86

LIABILITIES

Current:		
Accounts payable	$ 41,500.67	
Accrued taxes	62,543.52	
Dividend payable (paid January 2, 1932)	77,238.00	$ 181,282.19
Reserves:		
For fire, liability and boat insurance	$ 260,999.40	
For contingencies	175,000.00	435,999.40
Capital stock (no par value): Authorized 400,000 shares, issued 308,952 shares		
Common capital	$7,723,800.00	
Profit and loss—surplus	2,728,617.27	10,452,417.27
		$11,069,698.86

THE KELLEY ISLAND LIME AND TRANSPORT CO.
(Condensed income and expense and surplus account for the year ended December 31, 1931)

Income and expense		
Departmental operating profit, after deducting cost of material sold		$ 363,644.32
Depreciation and depletion on plants and property		147,240.73
Gross profit		$ 216,403.59
Selling, administrative and general expenses		245,403.16
Operating loss		$ 28,999.57
Other income, including income from investments, interest earned, etc.	$125,249.73	
Less: Other deductions	12,449.38	112,800.35
Profit before providing for federal taxes		$ 83,800.78
Provision for federal taxes		7,825.84
Net profit transferred to surplus		$ 75,974.94
Profit and Loss—Surplus		
Balance December 31, 1930		$ 3,406,927.33
		$3,482,902.27
Less:		
Dividends — $1.875 per share	$579,285.00	
Reserve providing for contingencies	175,000.00	754,285.00
Profit and loss—surplus December 31, 1931		$2,728,617.27

Coronet Phosphate Company

THE Coronet Phosphate Co., New York City, with plants in Florida, reports for the years ended December 31:

INCOME ACCOUNT

	1931	1930
Gross revenue	$817,118	$995,647
Operating expense, etc.	453,999	570,155
Depreciation and depletion	218,673	182,337
Operating income	144,446	243,155
Bond interest	14,580	17,288
Research, etc., expense	41,311	74,787
Federal taxes	4,825	17,961
Reserve for contingencies	50,000	.....
Net income	33,731	133,119
Dividends	37,500	150,000
Deficit	*$3,769	$16,881
Earned per share	$1.35	$5.32

Number of shares, 25,000.
*Before further reserve for contingencies in amount of $250,000 charged directly to surplus.

BALANCE SHEET, AS OF DECEMBER 31

Assets:	1931	1930
Phosphate lands	$2,218,707	$2,217,684
Plant equipment	1,625,283	1,773,853
Interest in blast furnace	485,725	405,279
Current assets:		
Inventories	162,785	270,406
Notes receivable	11,770	6,614
Accounts receivable	201,869	71,738
Cash	263,671	197,875
Sinking fund	841	841
Deferred assets	37,127	41,651
Total	$5,007,778	$4,985,941
Liabilities:		
Capital stock	$2,500,000	$2,500,000
Bonded debt	243,000	243,000
Current liabilities:		
Accounts payable	14,932	9,349
Accrued bond interest	7,290	7,290
Federal tax reserve	4,825	17,961
Dividends payable	.....	37,500
Reserve for depreciation	689,540	1,341,887
Reserve for depletion	673,007	
Contingent reserve	300,000	.....
Surplus	575,185	828,955
Total	$5,007,778	$4,985,941
Current assets	$640,936	$547,475
Current liabilities	27,047	72,100
Working capital	$613,889	$475,375

American Aggregates Corp.

THE American Aggregates Corp., Greenville, Ohio, reports for the years ended December 31 consolidated income account as follows:

	1931	1930
Net sales	$1,883,355	$3,784,837
Cost of sales	1,330,314	2,400,322
Depreciation	381,650	480,344
Depletion	36,286	48,403
Selling, administrative and general expense	344,705	489,476
Operating income	(d)209,600	366,292
Other income	*235,177	265,837
Total income	25,577	632,129
Interest and discount	118,640	173,246
Federal taxes	.....	69,700
Other deductions	.....	52,735
Net income	(d)93,064	336,446
Preferred dividends	129,157	171,593
Common dividends	.....	167,932
Deficit	$222,221	$3,079
Earned per share, common	nil	$0.87

Number of common shares, 188,827.
*$89,975 interest earned and miscellaneous income (net) and $145,202 income from allied operations.

CONSOLIDATED BALANCE SHEET, AS OF DECEMBER 31

Assets:	1931	*1930
†Plant and equipment	$5,207,357	$5,379,560
Investments in affiliated companies	292,441	301,033
Other assets	107,049	140,346
Mortgage notes	600,000	600,000
Current assets:		
Cash	78,204	123,533
Marketable securities	‡205,266	$45,347
Accounts and notes receivable	477,894	730,393
Inventories	190,880	223,974
Prepaid insurance, taxes, etc.	22,495	40,346
Unamortized discounts and expense	119,103	140,671
Unamortized franchise costs, etc.	89,622	79,478
Total	$7,390,310	$7,804,681
Liabilities:		
Preferred stock	$1,845,100	$1,845,100
¶Common stock	2,486,471	2,486,471
Funded debt	1,117,500	1,217,500
Current liabilities:		
Real estate purchase contract	29,600	41,982
Notes and accounts payable	93,109	119,088
Preferred dividends payable	32,289	.....
Accruals	121,510	106,636
Federal tax reserve	23,769	73,374
Deferred income	92,032	7,389
Deferred liabilities	128,050	72,600
Employes' notes	.....	191,441
Capital surplus	633,736	633,736
Earned surplus	787,144	1,009,364
Total	$7,390,310	$7,804,681
Current assets	$952,244	$1,123,247
Current liabilities	300,277	341,080
Working capital	$651,967	$782,167

*After giving effect to sale of plants, properties and equipment in Cincinnati district and transactions incidental thereto as provided in agreements of February, 1931. †Less depreciation and depletion: 1931, $2,342,291; 1930, $2,116,087. ‡At cost. §U. S. Treasury bonds only. ¶Represented by 188,827 no par shares.

Commenting on the financial report, F. D. Coppock, president of the company, stated:

"The earnings of the corporation during 1931 were seriously affected by the prevailing depressed economic conditions. State highway programs in most of the territories served were well maintained but, on the contrary, demand for railway ballast and general building aggregates was severely curtailed. In comparison with 1930, tonnage production during 1931 decreased approximately 16%, whereas net sales declined approximately 30%, reflecting the result of a more active competitive condition by reason of a restricted demand. As a result of the foregoing adverse conditions the corporation during 1931 suffered a loss of $93,063.61. However, $90,951.39 of such total loss was directly attributable to the truck manufacturing department in process of liquidation.

"Total depreciation and depletion charges absorbed in operation during the year amounted to $417,935.50 as compared to $398,141.58 during the year 1930 after eliminating depreciation taken on the Cincinnati properties during 1930.

"The corporation's present cash position compares favorably with its cash position at the end of 1930 after giving effect to the sale of the Cincinnati properties. The decrease in working capital is attributable to the loss for 1931, the retirement of $100,000 of the corporation's debentures and the payment of preferred dividends. The board of directors has adopted the policy that dividends on the preferred stock will not be paid quarterly during 1932 and that the earnings for the year will be determinative of whether or not any dividends will be paid on the preferred stock.

"It is a truism that the ability of the corporation to make profits in the future is dependent not only on the state of general business in those territories wherein operations are conducted but also on the resumption of substantial ballast purchases by the railroads. It is impossible to analyze with any degree of certainty the present trend of general business conditions. Moreover, it is problematical when the railroads will recover sufficiently to justify the inauguration of appreciable ballast programs."

Lawrence Portland Cement

THE Lawrence Portland Cement Co., Northampton, Penn., reports the year ended December 31, 1931, that the funded debt of the company was considerably reduced during the year. Bonds to the par value of $177,000 were purchased, of which $150,000 par value were canceled by the trustee in accordance with the sinking fund provisions. During the past two years an aggregate par value of bonds amounting to $300,000 were thus canceled and the company now holds $86,000 par value to meet future requirements of the sinking fund. On December 31, 1931, the bonds outstanding amounted to $1,614,000. Funded debt was also reduced by the payment of a serial note for $60,000 which matured Nov. 18, 1931.

It was unnecessary to make extensive changes or additions to plants during the year, both plants having been kept in excellent repair. At Siegfried, Penn., "Hum-mer" screens connected with the Bradley and tube mills were installed; and at Thomaston, Me., a vacuum cleaning system was installed in the coal mill. Machinery was installed in the lime plant at Thomaston enabling the company to manufacture insecticides. This new product provides a new outlet for the lime used in its manufacture.

CEMENT AND LIME SALES OF THE LAWRENCE PORTLAND CEMENT CO. IN 1931

	Manufactured	Sold
Dragon Portland (bbl.)	1,835,499	2,134,373
Dragon Super (bbl.)	37,025	41,533
Hy-Test (bbl.)	315,458	317,040
Strongfast (bbl.)	11,446	17,453
Lime (net tons)	13,815	14,372

CONDENSED STATEMENT OF THE INCOME OF THE LAWRENCE PORTLAND CEMENT CO.
(Year Ended December 31, 1931)

Income from sales of cement and lime		$ 12,939.43
Other income		83,666.63
		$ 96,606.06
Provision for depreciation, interest, bond discount amortization, bad debts and reduction from cost to market value of inventory of cement, clinker and supplies		539,626.36
Net loss carried to surplus account		$443,020.30

(This compares with a profit of $763,302, or $10.18 per share, in 1930.)

CONDENSED BALANCE SHEET OF THE LAWRENCE PORTLAND CEMENT CO.
(As of December 31, 1931)

ASSETS

Land, buildings, plant and equipment	$11,696,949.69	
Deduct: Amount reserved for depreciation	2,814,386.89	$8,882,562.80
Current assets:		
Cash and accounts receivable (less reserve for doubtful accounts)	$ 573,202.90	
Cement, materials and supplies on hand (valued at lower of cost or market)	905,476.39	1,478,679.29
Investment assets		225,300.00
Deferred charges (including unamortized bond discount)		73,689.25
		$10,660,231.34

LIABILITIES

Current liabilities (accounts payable)		$ 80,925.39
(Excess of current assets over current liabilities, $1,397,753.90)		
Funded debt:		
15-year 5½% gold debenture sinking fund bonds, due April 1, 1942	$1,614,000.00	
Notes payable due serially beginning November 18, 1932	120,000.00	1,734,000.00
Reserve for lime kiln repairs		8,098.67
Capital stock, issued and outstanding		7,500,000.00
Surplus		1,337,207.28
		$10,660,231.34

Petoskey Portland Cement

THE Petoskey Portland Cement Co., Petoskey, Mich., reports for the years ended December 31, 1931 and 1930, a net profit (or loss) after depreciation, interest and other charges:

	1931	1930
Years to December 31	$252,761*	$105,873
Earned per share	nil	$0.53

Number of shares, 200,000.
*Deficit.

Called for Redemption

A TOTAL of $61,000 first mortgage 6% sinking fund bonds of Pennsylvania Glass Sand Corp., due July 1, 1952, have been called for payment July 1 next at 105 and interest at any of the following offices of Brown Bros. and Co.: 1531 Walnut street, Philadelphia, Penn.; 59 Wall street, New York City, or 60 State street, Boston, Mass.

Retain Mill Base Price on Wisconsin Cement

THE CEMENT SITUATION in Wisconsin appears to be settled, says a bulletin issued by the Wisconsin Retail Lumbermen's Association, the *Chicago* (Ill.) *Journal of Commerce* reports. Discrimination in price has been eliminated and trucking of cement practically terminated by a new 85c. La Salle, Ill., base, it is declared.

Settlement follows opposition to establishment of Milwaukee as a basing point on cement shipments. The association objected to the Milwaukee basing point policy on the ground that it encouraged trucking and worked hardships on regular dealers.

"It is a distinct and definite relief to all dealers who were in the trucking zone near the cement storage silos," says the bulletin, "to know that cement can now be obtained at a lower price by rail than by trucking. Not many truckloads of cement will now go up and down the highways to unknown destinations."

According to the *Washington* (D. C.) *Star* the price of cement there was increased 24c. a barrel June 1 in the first major price increase of this commodity in about a year and a half.

Retail prices under the advance now stand at from $1.95 to $2.10, dealers said.

Rules Duty on German Cement Is Proper

A TREATY between the United States and Germany, under the terms of which a higher rate of duty shall not be levied on imports to either country than that imposed on those from other nations, is not operative in the case of portland cement, the United States Customs Court has decided in dismissing a protest by Materials, Inc., as importers. Justice McClelland's opinion cites the tariff provision for duty equal to that assessed by the country of origin on similar products from this country. Inasmuch as cement from the United States pays $0.17865 per 100 kilos in Germany, he concludes, it is no violation of the treaty to assess the same duty on importations from Germany.—*New York* (N. Y.) *Journal of Commerce.*

Agreement Provides for Yugoslavia Cement Shipments to Brazil

YUGOSLAVIA and Brazil have granted each other mutual tariff rights and privileges in an endeavor to improve their commercial relations and strengthen their economic positions generally.

Yugoslavia on its part obtains preferential tariffs on large quantities of cement and other manufactured products which it exports to Brazil. It was agreed that the treaty should take effect immediately, without waiting for ratification by parliaments.—*Christian Science Monitor.*

Joseph S. Young Elected President of Lehigh

JOSEPH S. YOUNG was elected president of the Lehigh Portland Cement Co. May 16 at a meeting of the board of directors to succeed his father, the late Col. E. M. Young, one of the founders and, since its organization, an executive officer of the company.

To Mr. Young has been accorded the distinction of being the youngest chief executive of any major cement company in the country. Born at Allentown, Penn., June 15, 1898, he is just rounding out his 33rd year.

Mr. Young prepared for college at Lawrenceville School, graduating in 1915. He then entered Princeton University with the class of 1919. When the United States entered the World War in 1917 Mr. Young

Photograph by Metzger

Joseph S. Young

enlisted in the Pennsylvania National Guard and later served as an instructor in the Machine Gun Officers Training School at Camp Hancock, Ga., until after the armistice. Upon discharge he resumed his studies at Princeton and graduated in 1920. Mr. Young later entered law school and received his Bachelor of Laws degree from Columbia University in 1923. Although never in active practice, he is a member of the Pennsylvania bar.

On September 16, 1926, Mr. Young was married to Marion I. Johnson, the daughter of George W. Johnson, president of the Endicott Johnson Corp., Endicott, N. Y.

In the fall of 1923 Mr. Young entered the employ of the Lehigh company. In 1926 he was elected vice-president and assistant to the president, which position he has filled continuously since. Mr. Young was elected a member of the board of directors of Lehigh Portland Cement Co. in 1931. For several years he has served on the board of the Great Lakes Portland Cement Corp. He is also a director of the Eclipse Lighterage and Transportation Co., Lehigh Lime Co. and the Allen County Supply Co. Just a few weeks ago he was appointed to serve on the board of directors of the Portland Cement Association.

Mr. Young has been prominently identified with the affairs of the cement industry for the past few years. In 1928, 1929 and 1930 he was an active member of the tariff committee for the American portland cement manufacturers. The efforts of this committee resulted in what tariff protection the cement industry now enjoys. In 1930 he was chosen to head the newly organized committee on public relations of the Portland Cement Association and served as the chairman of this committee for two years.

Shortly after his election Mr. Young is reported to have made this statement: "My father was long recognized in the cement industry as a champion of orderly marketing and price maintenance. So long as it is within my power these principles will continue to guide the sales policies of the Lehigh Portland Cement Co."

Confiscate Cement Plant Under Mexican Law

THE STATE of Hidalgo, Mexico, has announced through Governor Lugo that it has taken over the Cruz Azul cement plant, the first private property expropriated under the new law which went into effect May 1. A governor is permitted to condemn any property believed to be needed by the state. It was shut down by the owners, who opened other plants outside the state. Attorneys for the owners are fighting the law, alleging it is unconstitutional.

Beg Your Pardon!

IN THE REVIEW of the article, "Some Studies in Drilling and Blasting in Highway Work," in the April 23 issue of ROCK PRODUCTS, the author, Andrew P. Anderson, was quoted as believing that for efficient work the largest rock should be one-fifth the smallest inside dimension of the dipper. This should have read one-half the smallest inside dimension of the dipper. Mr. Anderson states that careful studies on a great many projects indicate that any very materially greater degree of fragmentation is not necessary for fast and efficient shovel operation.

New Lime Plant in Ohio

A LIME PLANT with three kilns is under construction at Lawrence Furnace, Ohio, for producing chemical lime.

The plant is located some distance from the railroad and the finished product will be trucked to southern Ohio, Kentucky and West Virginia.

Local capital is interested in the new enterprise, whch is being supervised by Carter M. Abel.—*Ironton* (Ohio) *News.*

Traffic and Transportation

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week ending June 11:

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

25483. **Sand, common** (not molding or fire sand), minimum weight 30 tons, from E. Swanton, Vt., to St. Johns, P. Q. Present, 70c; proposed, 60c net ton. Reason—Comparable to rate South Durham, Que., to Montreal, Que., of 65c net ton.

25361. **Stone chips or granules** (See Note 3), but in no case less than 60,000 lb. from Huberdeau and Lac Remi, Que., to E. Walpole, Mass. Present, no through rate in effect; proposed, $5.30 net ton.

TRUNK LINE ASSOCIATION DOCKET

29172. **Slag, crude or crushed**, in bulk, carloads (See Note 2), to Norfolk, Va., from Birdsboro, Pottstown and Swedeland, Penn., $2.45, and from Reading, Penn., $2.55 per net ton.

Sup. 2 to 29086. **Stone, natural** (other than bituminous asphalt rock), **crushed**, carloads (See Note 2), from LeRoy, N. Y., to Fassett, Gillett, Dunning, Snediker, Columbia X Roads, Tin Bridge, Troy, Cowley, Alba, Canton, Cedar Ledge, Grover and Leolyn, Penn., $1.50 per net ton.

29272. **Sand**, other than blast, engine, fire, foundry, glass, molding, quartz, silex or silica, in straight or mixed carloads (See Note 2), from Arundel, Md., to Harrisburg, Penn., $1.25 per net ton. (Present rate, $1.85.) (See Note 5.)

29135. To cancel commodity rate of $3.15 per net ton on **ground silica rock**, carload, from Baltimore, Md., to New York stations including S. I. R. T. Ry. stations and rate of $1.89 per net ton to Philadelphia, Penn., published in B. & O. R. R., I. C. C. 22169.

29279. **Gravel**, carload, minimum weight 50,000 lb., from Port Norfolk, Va., to Tasley to Cape Charles, Va., inclusive, 60c per net ton (note). Note—For building or improvement of public roads or streets and for the benefit of the public, not to apply when consigned to contractors or other parties than public officials (See Note 5).

29286. **Sand**, carload (See Note 2), from Toms River, N. J., to Ottawa, Ont., 26½c per 100 lb. (Present rate, 39½c, sixth class.) Reason—Proposed rate is comparable with rate from Millville, N. J.

29287. **Sand**, carload (See Note 2), from Toms River, N. J., to Drummondville and Quebec, Que., 33½c per 100 lb. (Present rate 42c, 6th class.) Reason—Proposed rate is comparable with rate from Vineland, N. J., etc.

29289. **Sand**, carload (See Note 2), from Vineland to Manumuskin, N. J., Port Elizabeth to Cape May, N. J., and Lewes, Del., to Drummondville, Que., 33½c per 100 lb. Reason—To establish same rate for C. P. Ry. delivery as now in effect for C. N. Ry. delivery.

29298. **Crushed stone** (not coated), carload (See Note 2), from LeRoy, N. Y., to Hammondsport, N. Y., $1 per net ton. (Present rate $1.20.) Reason—Proposed rate is comparable with rates to Hornell, Alfred and Campbell, N. Y.

29307. (A) **Sand**, viz., other than blast, engine, fire, foundry, glass, molding, quartz, silex or silica, carloads. (B) **Blast, engine, fire, foundry, glass, molding, quartz, silex and silica**, carloads (See Note 2), from Lehighton, Penn., to Phillipsburg, N. J. (A) 90c per ton and (B) $1.10 (See Note 5).

29309. Cancel commodity rates on **sand, blast, engine, fire, foundry, glass, molding, quartz, silex and silica**, in straight or mixed carloads, rate of $2.43 per net ton from Philadelphia, Penn., and rate of $1.35 per net ton from Baltimore, Md., to Alexandria, Va., published in P. R. R. G. O. I. C. C. 14238 and rate of $2.43 from Philadelphia, Penn., to Washington, D. C., published in P. R. R. I. C. C. 188. Rate of $2.39 from Philadelphia, Penn., to Uniontown, Washington, D. C., and Alexandria, Va., and rate of $1,39 from Baltimore, Md., to Uniontown, Washington-Georgetown district, and rate of $1.35 from Baltimore, Md., to Alexandria, Va., as published in B. & O. R. R. I. C. C. No. 22247. Reason—Investigation develops no traffic has moved for some time nor is there prospects for future shipments, therefore rates are obsolete.

29310. **Sand and gravel**, carloads (See Note 2), from Mendon, N. Y., to Penn Yan, N. Y., $1.10 per net ton. (Present rate, $1.25.) (See Note 5.)

29312. **Stone, crushed**, carloads (See Note 2), from Crusher Siding, Md., to Worth, Penn., $1.10 per net ton. (Present rate, $1.50.) Reason—Proposed rate is comparable with rate from Cumberland, Md., to Worth, Niverton and Hocking Jct., Penn.

29313. **Sand, viz., blast, common, engine, glass, molding, quartz, silica and silex**, carloads; flint, ground, carloads (See Note 2), on sand and 40,000 lb. on flint, from Granville, Horningford, Huntingdon, McVeytown, Mapleton, Mill Creek, Newton-Hamilton, Hyde, *Tatesville and Vineyard, Penn., to Strasburg, O., 14c per 100 lb. Reason—Proposed rate is same as now in effect to New Philadelphia, Parral and Fredericksburg, O.

*Rate from this point to apply on sand only.

29321. (A) **Sand, building**, carloads. (B) **Sand, glass, engine, molding, ground flint, quartz and silex**, in straight or mixed carloads (See Note 2), from Mapleton district and Tatesville, Penn., to Oakfield, N. Y. (A) $2.50 and (B) $2.75 per net ton. Reason—Proposed rates are comparable with rates to Rochester, Buffalo, Niagara Falls, N. Y., etc.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—To meet motor truck competition.

Note 5—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

29322. **Stone, natural** (other than bituminous asphalt rock), **crushed**, carloads (See Note 2), from Patterson, N. Y., to White Plains, Hartsdale and Scarsdale, N. Y., 90c per net ton. Reason—Proposed rates are comparable with rates from New Hamburg, N. Y.

29175. (A) **Building sand**, carload; (B) **sand, blast, engine, foundry, molding, glass, silica, quartz or silex**, carload (See Note 2), from Hancock and Round Top, Md., to Newark Valley (A) $2.70 and (B) $3.10 per net ton.

29289. **Sand**, carloads (See Note 2), from Bellmawr, Downer, Radix, Robanna and Williamstown, N. J., to Drummondville, Que., 33½c per 100 lb.

29330. **Sand and gravel** (other than blast, engine, foundry, glass, molding or silica), carloads (See Note 2), from Newburgh, N. Y., to Central Valley, N. Y., 75c per net ton. (Present rate, 90c.) (See Note 5.)

29332. (A) **Sand**, other than blast, engine, fire, foundry, glass, molding, quartz, silex or silica. (B) **Sand, blast, engine, fire, foundry, glass, molding, quartz, silex or silica**, in straight or mixed carloads (See Note 2), from Shippensburg, Penn., to Winchester, Va. (A) $1.05 and (B) $1.13 per net ton. (See Note 5.)

CENTRAL FREIGHT ASSOCIATION DOCKET

31672. To establish on **crushed stone**, in open top cars, carload, from Ingalls, Ind., to Elwood, Ind., 80c per net ton, emergency increase to be in addition. Present, $2 per net ton, emergency increase to be in addition.

31683. To establish on sand, viz., **blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing loam, molding or silica**, carload, from Dunkirk, N. Y., to Buffalo, N. Y., 83c per net ton. Present, $1.

31684. To establish on filter **sand and filter gravel**, carload, from Chicago, Ill., to Fort Wayne, Ind., 151c per net ton. Present rate, no through rates. Combination of intermediates based on Stoners, Ind. Route, via N. Y. C. R. R., Stoners, Ind., and I. S. C.

31697. To establish on **sand and gravel**, carload, from Columbus, O., to Fredericktown, O., 85c. Present, 90c per net ton.

31688. To establish on **slag**, in bulk, in open top equipment, carload, from Hamilton, O., to Rushville, Ind., 90c per net ton. Present, 260c.

31689. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, in open top cars, carload, from Ashtabula and Ashtabula Harbor, O., to Stanhope and Kinsman, O., 70c per net ton. Present, to Stanhope, 75c, to Kinsman, O., 80c.

31690. To establish on **stone, fluxing**, carload, from Whitehouse, O., to Cleveland, O., $1.15 net ton, and Elyria, O., $1.05 net ton. Present, class rates. Route, Wabash Ry., Toledo, O., N. Y. C. R. R.

31686. To establish on **crushed stone**, carload, from Milltown, Ind., to Armstrong, Ind., 110c net ton. Present rate, 114c.

31692. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), and **gravel**, carload, from Lafayette, Ind., to Buck Creek, Colburn and Delphi, Ind., 60c net ton. Present rate, to Buck Creek and Colburn, Ind., 69c; to Delphi, Ind., 70c. Route, via Wabash Ry. direct.

31694. To establish on **crushed stone**, carload, from Putnamville, Ind., to Shadeland and West Point, Ind., $1 net ton. Present rate, classification basis.

31731. To establish on **crushed stone**, coated with oil, tar or asphaltum, carload, from Chicago, Ill., to Detroit, Mich., 234c net ton. Present, 23c cwt.

31762. To establish on **stone, crushed and crushed stone screenings**, in bulk, in open top cars only, carload, from Ashtabula and Ashtabula Harbor, O., to Perry, Conneaut, Leon, O., 60c; Painesville, O., Swanville, Penn., Williamsfield, Wick, O., 70c; Andover and Mann, O., 65c per ton. Present, sixth class, except to Leon and Andover, O., 70c account intermediate to Jamestown, Penn.

31763. To establish on **sand, blast, core engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica**, in straight or mixed carloads, from East Liverpool, O., to Detroit, Mich., 189c; Indianapolis, Ind., 239c, and Louisville, Ky., 290c per cwt. Present, sixth class.

31770. To establish on **crushed stone**, carload, from Carey, O., to Lamira and Flushing, O., $1.35 net ton. Present, sixth class, to Lamira, O., 20c; to Flushing, O., 19c.

31771. To establish on **crushed stone**, in open top cars, carload, from St. Paul, Ind., to Dayton, O., 135c per net ton, emergency increase in addition. Present, 15c per cwt. (sixth class as per C. F. A. L. Tariff No. 486, I. C. C. 2450).

31772. To establish on **crushed stone**, in open top cars, carload, from Carey, O., and McVittys, O., to Willoughby and Painesville, O., 100c per net ton, subject to emergency charge. Present, to Willoughby, O., 17c cwt.; to Painesville, O., 18c cwt.

31773. To establish on **sand and gravel**, carload, from Massillon, O., to Wickliffe and Willoughby, O., 85c per net ton, subject to emergency charge. Present, 90c, subject to emergency charge.

31788. (a) To establish on **sand, blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica.** (b) To establish on **sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), or **gravel**, carloads, from Phalanx, O., to Raymilton, Penn. (a) $1.51, (b) $1.40 per net ton. Present, $2.80.

ILLINOIS FREIGHT ASSOCIATION DOCKET

3599-B. **Stone, crushed** (bulk), **rough** (not dimension or dressed), **rubble, rip rap, quarry strippings and limestone, unburned agricultural** (in bulk, in open top cars only) (See Note 3), from Lehigh, Van Siding and West Kankakee, Ill. (Rates per net ton.)

To	Pres.	Prop.
Gardner, Ill.	60	76
Coster, Ill.	60	70
Essex, Ill.	60	70
Bonfield, Ill.	60	70

4956. **Molding sand**, carloads (See Note 1), from Bowes, Ill., to Ottawa, Ill. Present—Class rates. Proposed—$1.40 per ton.

6639. **Agricultural limestone**, carloads, minimum weight 60,000 lb., from Elmhurst, Ill., to connecting lines in I. R. C. territory. Present—Crushed

stone basis. Proposed—Same basis as currently applicable from Chicago, Ill.

6642. **Sand and gravel,** carloads (See Note 3), but not less than 40,000 lb., from Buckhart, Ill., to Andrew and Cantrall, Ill. Present—Classification basis. Proposed, 88c per net ton.

6659. **Sand and gravel** (See Note 3), from Pit No. 5 (Crescent) Ill. to Peoria, Ill. Rates in cents per net ton. Present—51, plus emergency charge. Proposed—41, plus emergency charge.

6660. **Sand and gravel,** carloads (See Note 3), from Magner, Ill., to stations on Alton R. R. To (representative points) in Illinois:

	Proposed Pres- ent	per net ton		Proposed Pres- ent	per net ton
Delavan	*	$1.26	Thayer	*	1.13
Petersburg	*	1.13	Hagaman...	*	1.26
Lincoln	*	1.13	Kahn	*	1.40
Griggs	*	1.26			

*Classification basis.

6662. **Limestone, agricultural,** in barrels and boxes or in bulk, in bags, barrels and boxes, less carloads, from points in I. F. A. territory to points in I. F. A. territory. Present—Fourth class (50% of first class). Proposed—30% of first class (one and one-half Class E).

3330-P. **Sand and gravel,** carloads (See Note 1), from Chillicothe, Ill., to Edelstein, Ill. Rates per net ton—Present, 80c plus 6c emergency charge; proposed, 45c plus 10% emergency charge.

3718-J. **Sand and gravel,** carloads (See Note 3), from Lincoln and Mackinaw, Ill., to points on the Illinois Terminal Co., Woodside, Chatham, Little Mackinaw, Irvin's Park, Auburn, Ill. Rates per net ton—Present, 76c; proposed, 70c.

5253-D. **Molding sand,** carloads (See Note 3), but not less than 40,000 lb., from Iola, Ill. Rates per net ton.

To	Present	Proposed
East St. Louis, Ill.	$1.15	*
St. Louis, Mo.	1.27	*
Decatur, Ill.	1.39	*
O'Fallon, Ill.	1.15	*
Springfield, Ill.	1.26	*

*Classification basis.

6190. **Gravel, gravel pit strippings, sand and sand pit strippings** (See Note 3), but not less than 40,000 lb., from Magner, Ill., to Barry, Hadley, Pittsfield, Griggsville, Valley City, etc., Ill. Rates per net ton—Present, 63c; proposed, 50c.

6664. **Gravel,** carloads (See Note 3), from Elco and Gravel Pit, Ill., to C. & E. I. Ry. stations. Rates per net ton. To (rep. pts. in Ill.):

	Pres.	Prop.		Pres.	Prop.
Altamont	$1.61	$1.13	West Vienna	1.01	.90
Kinmundy....	1.61	1.10	Olive Branch	1.01	.85
Mt. Vernon..	1.01	1.00	Karnak	1.39	.90
Johnson City	1.01	.95			

6665. **Gravel,** carloads (See Note 3), from Elco and Gravel Pit, Ill., to I. C. R. R. stations in Illinois. Rates per net ton. To (rep. pts. in Ill.):

	Pres.	Prop.		Pres.	Prop.
Effingham ..	$1.39	$1.20	Tonti	1.39	1.13
Edgewood ..	1.39	1.13	Odin	1.39	1.08
Mason	1.39	1.20			

6670. **Sand and gravel,** carload, from Magner, Ill., to points on Illinois Terminal R. R. To establish following commodity rates: Proposed rates per net ton to (representative) points—Chatham, Ill., $1.10; Girard, Ill., $1.13; Coopers, $1.15; Sawyerville, $1.26.

SOUTHWESTERN FREIGHT BUREAU DOCKET

24896. **Sand, gravel, crushed stone, etc.,** from Frisbie, Kan., to points in Missouri. Add new section (Section 9) Item 160, S. W. L. Tariff 162-D, W. T. L. Tariff 238, reading as follows: "To stations in Missouri (except stations specified in Item 140, and except stations on the Kansas City Southern south of Mulberry, Mo.), rates on crushed stone, gravel and sand (except silica sand, in box cars), from Frisbie, Kan., will be 4c per ton of 2000 lb. higher than the rates from Holliday, Kan., determined in accordance with Section 5 of this item and will only apply when routed via Kansas City, Mo. It is stated that the rates prescribed in I. C. C. Docket 17000, Part 11-A, result in undue discrimination against Frisbie, Kan, versus Holliday, Kan., the shipper at Frisbie being obliged to pay 1c per 100 lb. higher than the rate from Holliday for delivery in Kansas City Switching district or a difference of only 6 mi. by rail and the difference of 1.96 mi. beyond the 15-mi. zone limit. To points in Missouri outside of the Kansas City Switching district he pays from 15c to 25c per ton higher than the shipper at Holliday.

Proposed I. C. C. Decisions

14508. Truck-Barge Plaster Transport. Competition by trucks and barges on the New York state canal in the hauling of plaster and plaster articles from western New York to Atlantic coast terminals, in the opinion of Examiner M. L. Boat, expressed in a proposed report in fourth section application No. 14508, is not justification for reduced rates by the railroads made without regard to the long and short haul part of the fourth section. Therefore he has recommended denial of the application filed by W. S. Curlett, as agent for the affected carriers, for authority to establish reduced rates on the commodities mentioned, on 50,000-lb. carloads, from Akron, Clarence Centre, Oakfield and Wheatland, N. Y., to Atlantic coast terminals without observing the fourth section. The Atlantic Coast terminals referred to are those at and around New York, Brooklyn and Jersey City.

The Curlett application was for permission to establish a rate of 13c plus the Ex Parte 103 charges, from the grouped points of origin to the grouped points of destination, without reducing the rates from and to intermediate points to meet the competition of hauling by trucks to barges on the canal and transportation by barges to the destinations. Transportation of that sort, Mr. Boat said, began late in 1931. He said the transportation had been small and that generally it had not been regarded as practical or economical, such as had taken place having, as he said, been due to clearly abnormal circumstances. He said that if the 7,081 tons that had moved over the canal route had been moved over the all-rail routes, the resulting revenue would have been $24,000. The reductions, if applied to the volume of all-rail plaster tonnage which moved in 1931, would have totaled about $80,000. One of the abnormal circumstances cited was the distress of certain of the canal operators, causing the quotation of very low rates. But even assuming the recurrence of that condition, Mr. Boat said it did not appear that sufficient tonnage would be attracted to justify the relief which would be necessary to make effective the substantial reductions in the rates proposed in the application.

I. C. C. Decisions

19957. Lime. Northwestern Ohio Lime Manufacturers et al. vs. Pennsylvania et al., embracing also No. 16170, Eastern Lime Manufacturers Traffic Bureau et al. vs. A. & B. B. et al., and a sub-number thereunder, Washington Building Lime Co. et al. vs. A. & B. B. et al.; **19951,** Ohio Hydrate & Supply Co. vs. Pennsylvania et al.; **20234,** Acme Glass Co., Inc., et al. vs. Pennsylvania et al., and a sub-number thereunder, Berney-Bond Glass Co. vs. Pennsylvania et al. Report of commission on further hearing. Former reports, 112 I. C. C. 7, and 159 I. C. C. 9, modified in part. Rates, agricultural and fluxing lime, minimum 30,000 lb., producing points in Maryland, Pennsylvania, West Virginia, Virginia and Ohio to central territory and from Ohio to destinations in trunk-line and New England territories, not unreasonable in the past or unduly prejudicial, but unreasonable for the future when applied to shipments of 50,000 lb. or more to the extent that they exceed or may exceed 80% of the rates on common lime, hydrated, quick or slaked, minimum 30,000 lb., between the same points. Further finding that outstanding order in Eastern Lime Manufacturers Bureau vs. A. & B. B., 112 I. C. C. 7, should be modified so as to eliminate the provision which requires the carriers to maintain rates on agricultural and fluxing lime, having no commercial value for building or chemical purposes, in carloads, minimum 30,000 lb., on the basis of 80% of the rates prescribed therein for application on common lime, hydrated, quick or slaked, between the same points. Order for future effective on or before August 16.

22315. Crushed Stone to Carolinas. A revision of the rates on crushed stone, crushed stone screenings, chert and stone dust from Rocky Point, Va., to destinations in the Carolinas, to be made not later than August 31, has been ordered in No. 22315, Liberty Lime and Stone Co., Inc., vs. A. & R. et al. The Interstate Commerce Commission has found the rates on crushed stone, crushed stone screenings and chert from Rocky Point to the Carolinas unreasonable, prescribed new ones, and awarded reparation. It has also found rates on ground or pulverized limestone, described as filler for highway construction, from and to the same points, applicable on certain shipments covered by the complaint. A finding of unreasonableness has also been made on stone dust from Rocky Point to specified destinations in the destination territory, the commission prescribing new ones and awarding reparation.

Rates on crushed stone, crushed stone screenings, not embracing stone dust, were found unreasonable to the extent they exceeded or might exceed rates prescribed for like distances in No. 17517, rates on chert, clay, sand and gravel, 122 I. C. C. 133; 140 I. C. C. 85; 160 I. C. C. 309; and 172 I. C. C. 219, referred to in the report as No. 17517, distances to be computed over the rate-making routes; provided that in no instance shall the rate exceed by more than 20c. a net ton the rate that would be produced by applying the No. 17517 scale to the distances over the shortest routes over which traffic can be moved without transfer of lading; and provided further that an arbitrary of 25c. a net ton may be added to points on the Aberdeen and Rockfish, the Atlantic and Yadkin, the Norfolk Southern and the Wilmington, Brunswick and Southern, to accrue solely to them.

Rates on stone dust were found unreasonable to the extent they exceeded or might exceed the rates prescribed for like distances in No. 22771, Falling Spring Lime Co. vs. C. & O., 172 I. C. C. 783. An arbitrary of 25c. a ton is to be added to these rates for the benefit of the carriers mentioned in connection with rates on crushed stone. To all these rates, the commission said, might be added charges allowed in the Fifteen Per Cent. Case, 1931.

Commissioner Brainerd dissented. He said that as the rates for the future were generally higher than the present rates, the rates charged and the present rates should be found not unreasonable except for the future and then only in instances where they might exceed the maximum basis set forth in the report.

Asks Reduced Switching Rates for Lyman-Richey from Fremont

REDUCED switching rates for the Lyman-Richey Sand and Gravel Co., from its pit near Fremont, Neb., were requested recently of the state railway commission by the Northwestern railroad. With the filing of this application, the gravel company withdrew its complaints against the railroad, charging that it was discriminating in offering other concerns lowered switching rates at pits near Fremont.—*Lincoln* (Neb.) *Star.*

Foreign Abstracts and Patent Review

Method of Determining Soluble Silica in Pozzuolanas and Pozzuolanic Cements. G. Baire discusses the determination of soluble silica in the pozzuolanas and in pozzuolanic cements. The ordinary hydrochloric acid method indicated by Chesneau, while satisfactory for portland cement, is found to give abnormal results when used with pozzuolanic cements. Nor is the method of Florentin for determining soluble silica by using hydrochloric acid applicable to pozzuolanas, in which the silica is in free state and is not soluble in acid. In order to dissolve this silica, which is an acid, it is necessary to place it in contact with an energetic base, which, as given by Cayeux, is caustic potash; while this method is satisfactory for gaize and some other pozzuolanas, it is not satisfactory for cement mixtures, for the silicates are but partly decomposed. The author proposes to combine this method with the first, that of the hydrochloric acid and that of the carbonate of soda, in the case of cement mixtures, in order to be certain that the dissolution in the test will be complete, for the mixture contains at the same time silicates and uncombined silica. His proposed method is as follows:

One gram cement is diluted in 100 cu. cm. of distilled water, subjected when cooled to 25 cu. cm. of 1:1 hydrochloric acid under constant agitation; heated rapidly for some moments until the liquid becomes light yellow (if the binder contains iron); then the hot liquid is filtered in an ashless filter and washed six times in boiling water. The filter is opened, the precipitate passed in a porcelain dish by means of a jet of hot water, the filter and the traces of precipitate which may remain attached to it, all added to the primary precipitate and then dried almost completely. It is not dried completely to avoid its forming into lumps which render the consequent operations more difficult and slower.

Then 100 cu. cm. of 20% caustic potash (K_2O density 1.177) is added in the dish, left in the cold for 20 hr., and then for 4 hr. at a heat between 50 and 65 deg. C. Then the specimen is decanted in a one-liter glass, being washed 4 or 5 times by decantation with cold water, each time leaving the residual precipitate deposit in the dish, and collecting the waters in the glass. The precipitate remaining in the dish is filtered. The filter is washed first 7 or 8 times with boiling water, then 5 times with boiling water containing 1/10 hydrochloric acid, and then 7 or 8 times with pure boiling water. The water coming from the washing of the precipitate is discharged.

The water of decantation, on the other hand, is allowed to rest for several hours (or over night, if possible). The clear liquid is then decanted in collecting on the filter the deposit which has formed, operating as for the primary precipitate; washing in boiling water, then in boiling water acidified wth hydrochloric acid, and then in pure boiling water. In this manner the fine and light precipitate which may have escaped the first decantation is collected.

The two filters are placed together, calcined, treated by the mixture of alkaline carbonates, and then the operations are continued as in the determination of silica. The result obtained gives the insoluble. By difference with the total silica, the soluble silica is obtained. The action by the mixture of the carbonates is for the purpose of freeing the alumina coming from the silicates of alumina of the pozzuolanas (if they contain it), silicate which remains is not attacked. This fusion can dispense the washing in acidulous water and in boiling water. But these washings have the advantage of removing the caustic potash.

This method is applicable equally to pure pozzuolanas (not mixed). The method enables the comparison of one cement with the other, for the results are not abnormal. When analyzing unmixed pozzuolanic cements, it is preferable, because it contains much silica, to use ½ gram instead of 1 gram of the cement. Identical samples of cement gaize showed 31.95% insoluble silica, 12.75% soluble silica, and 1.30% loss on ignition when using the customary test method, but 19.15% insoluble silica, 25.55% soluble silica, and 1.30% loss on ignition when using the method proposed.

Pozzuolanic cements composed of 65% portland cement clinker, per 35% pozzuolanas, gave results in per cent. by the proposed method, shown in Table I.

A cement gaize prepared in the laboratory by mixing 65% portland cement clinker with 35% burned gaize and 2% gypsum showed in per cent.:

Item	Clinker	Gaize	Mixture in laboratory	Mixture in plant
Insoluble silica	0.10	48.80	17.30	17.80
Soluble silica	22.70	33.50	25.70	24.90
Loss on ignition	0.90	2.65	1.60	1.95

Table II shows results in per cent. obtained on diverse products by new method.

—Revue des Materiaux de Construction et de Travaux Publics, 262, (1931) pp. 268-271.

TABLE I. RESULTS OF PROPOSED METHOD ON POZZUOLANIC CEMENTS

Pozzuolanic cements	Gaize	Pozzuolana	Trass	Mo-ler	Kieselguhr
Insoluble silica	19.25	16.50	8.30	11.80	9.60
Soluble silica	25.10	18.30	25.25	27.55	28.50
Loss on ignition	1.60	0.95	4.80	1.80	3.90

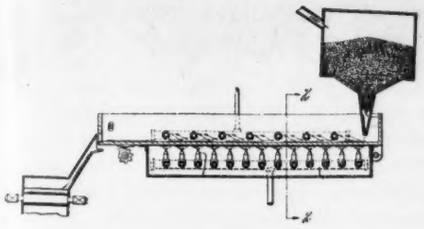
TABLE II. RESULTS, IN PER CENT., ON DIVERSE PRODUCTS

Item	Clinker	Gaize	Italian pozzuolana	Trass	Mo-ler	Kieselguhr
Insoluble silica	0.15	54.50	47.80	22.70	35.00	26.60
Soluble silica	22.75	29.90	20.20	31.10	35.20	42.20
Alumina	6.70	6.80	28.70	.....	12.80	.....
Ferric oxide	2.60	3.30	0.90	.....	8.00	.....
Lime	65.20	1.10	0.90	.....	1.50	.....
Magnesia	1.20	1.05	0.30	.....	1.84	.....
Sulphuric acid	0.27	0.30	.....	.....	1.10	.....
Loss on ignition	0.80	2.90	1.10	11.90	3.60	7.40
Not determined	0.33	0.15	0.10	.....	0.96	.....

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Construction Material. A new material for walls which is said to have exceptional sound absorbing qualities is made by casting a porous facing on wall board or other backing, such as fiber board. One composition for the porous facing is 85-95% by volume of ordinary casting plaster, 2% to 8% of magnesium carbonate and 2% to 8% of aluminum sulphate. When these are mixed with water to form a semi-fluid mass the action of the aluminum sulphate on the magnesium carbonate liberates carbon dioxide which is trapped in the body of the cementitious material. Three to eight per cent. by weight of hair, hemp, asbestos or other fiber may be added to make it more resistant to shock. No retarder is needed, the gas bubbles serving to prevent a too rapid set of the gypsum. Color may be added as desired. Where holes are to be made for attaching the wall board and its face pegs are put in holes in the wall board while casting the facing and withdrawn to leave holes for screws or nails. Tie wires may be cast in to fasten the board with its facing to ceilings or other places. The material is cast right on the board and gently troweled or struck off with a straight edge. *—Gordon C. Douglas, Assignor of One-Half to David G. Small, Los Angeles, Calif. U. S. Patent No.* 1,804,753.



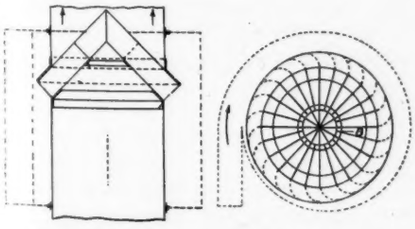
Lowers calcining temperature by reducing pressure

Method of Producing Lime. The greater part of the specification is given to a discussion of present practice and pointing out the defects of burning in vertical and rotary kilns. The inventor's method is to crush the limestone and feed it to make a thin layer on a table that is hot enough to decompose limestone. To decompose at a lower temperature than that of ordinary practice he draws off the CO_2 as fast as it is formed, thus reducing the pressure.

The simplest form of apparatus for this is shown, although a device with a revolving table is also covered by the patent. In the device shown the limestone crushed to pass 3 mesh or 4 mesh is fed to the table through a rotary valve (a cross feeder) and a flat spout as wide as the table. The table is inclined and the upper end pivoted. The lower end is jarred by a ratchet and the jar and the slope cause the particles to move down hill to the discharge.

The table is heated by gas jets or oil jets in a combustion chamber below it. Above the table is a box with pipes which are connected to a suction pump for removing CO_2. The pipes may also be used for sweeping with fresh air to remove CO_2. The inventor states that from 5 to 10 min. on the table is sufficient to turn granules of the size mentioned to lime. He also claims that the product has superior slaking qualities due to its being burned quickly.—*Guy H. Hunt, U. S. Patent No.* 1,824,351.

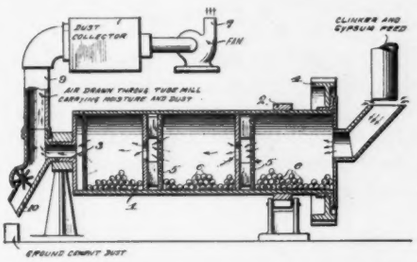
Dust Collector. The invention applies to those forms of dust collectors in which the air or gases are given a whirling motion. The forcing of the whirling gases to the atmosphere through the ordinary outlet pipe takes considerable power. To reduce this the inventor places a series of radial blades in the outlet to cause the gases to take a lineal flow. The blades are not set squarely across the flow but at an angle to form a sort of conical roof.—*John Whitmore, assignor to Davidson and Co., Belfast, Ireland, U. S. Patent No.* 1,824,455.



Radial blades control flow of air

Hydraulic Cement and Mortar. To prevent disintegration of concrete in percolating waters which may contain alkali salts, carbonic acid, organic matter or other impurities the inventor makes a mixture of 2% aluminum, 8% ferrosilicon and 90% portland cement clinker. These metallic compounds will react with the lime liberated by the waters to form insoluble compounds, and these compounds will be of a greater bulk than the lime liberated and so the voids in the concrete are filled, thus sealing it against the entrance of more water. Best results have been secured by crushing the clinker, ferrosilicon, aluminum and gypsum to about 20 mesh, mixing and grinding in a tube mill to 90% through 200 mesh. The metal is practically inert unless it is pulverized far finer than 200 mesh. It is suggested that the raw materials of portland cement may be sintered or melted with carbon or other reducing agent so that some free silicon is formed and the resulting clinker ground to cement.—*Charles A. Newhall, U. S. Patent No.* 1,802,667.

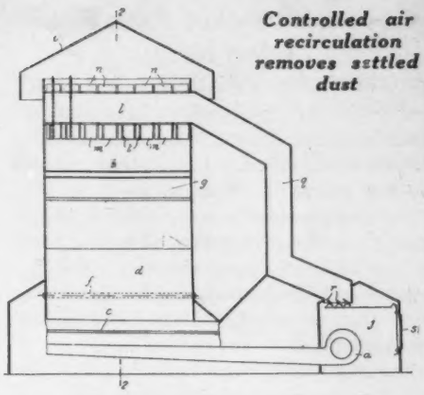
Process of Making Portland Cement. The inventor says that in grinding portland cement clinker with gypsum the heat liberated acts upon the gypsum and drives off



Grinds clinker in closed tube mill

the water of crystallization. This water reacts with the ground portland cement clinker and injures its ultimate hydraulic properties. To remedy this the inventor grinds clinker in a closed tube mill and draws air through it by a fan. The current of air removes the moisture and any dust that may be present. This dust is removed in a dust collector between the mill and the fan. A rotary valve in the discharge spout prevents air from entering it. Otherwise the ground product of the mill would be pulled into the fan.—*Richard D. Cheeseman, U. S. Patent No.* 1,802,196.

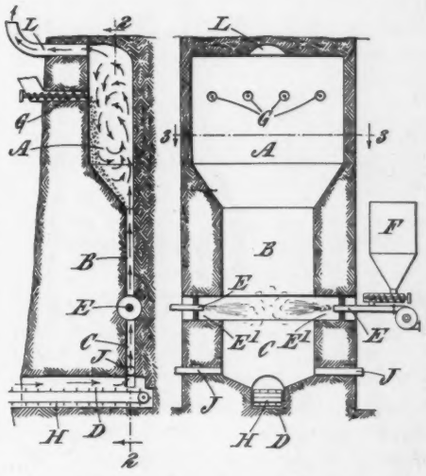
Separating and Grading. In the device shown the feed is carried on a flat reciprocating screen (C). A blast of air coming through the screen lifts the fines which are caught in pockets. The air then rises through the chamber and goes into a duct (1) that takes it back to the fan. Thus the air is in closed circulation. The improvement here is in putting openings in the top and bottom of the rectangular cross sectioned duct which communicate with the chamber and with the air. This allows such a control of the return to the fan that all



Controlled air recirculation removes settled dust

the air or a part of the air may be taken from the outside atmosphere without allowing any dust to escape. It also tends to prevent settling of dust in the duct and the rapid removal of any dust that settles.—*Frank Hopkinson, U. S. Patent No.* 1,776,225.

Kiln for Manufacturing Lime or the Like. Although spoken of as a lime kiln, the use explained in the specification is that of making portland cement. The kiln is excavated of the shape shown in rock (back of a quarry face or some similar situation). There is a thin flat section in which most of the burning takes place and an enlarged section above where the material is prepared. Heat comes from two oil or powdered coal burners (E). The slurry or dry powder is put into the upper chamber by four screw conveyors (G). There is a downward current on that side of the chamber which carries it to the thin flat section. Here it meets an upward current which lifts it and thus it is kept circulating until the particles are shrunk and hardened so that they will fall against the up current and go down through the flame from the burners which burns them to clinker. The clinker falls into a tunnel through which a conveyor draws the clinker to the outside, cooling it as it goes. Pipes are provided so that the air for combustion may be drawn over the hot clinker to preheat it.—*Geoffrey Martin, England, U. S. Patent No.* 1,804,362.



Kiln built at quarry face

Governor Pinchot Asks Road Bond Issue

GOVERNOR PINCHOT of Pennsylvania has proposed a constitutional amendment for a road bond issue of $50,000,000, to be repaid out of gasoline receipts without increase in taxation.

He also proposed a constitutional amendment to let the state collect such local taxes as the legislature may determine, and distribute such proportions as the legislature may allot to meet the expenses of local government.

These proposals were made in connection with conferences which have been held with legislative leaders on the subject of a special session for relief legislation.

Governor Pinchot declared he was opposed to suggestions heretofore made for new kinds of taxation for unemployment relief.

"This is no time to load the people with new taxes," he said.

"It is most unjust, in my opinion, to ask the people to pay the whole cost of unemployment relief while they are suffering from the depression. The taxpayer's burden will be lightened if most of it is carried over to more prosperous times by making a state loan to reimburse counties, cities and poor districts for moneys which they will expend for necessary unemployment relief.

"It is true that in 1931 I proposed new taxes for unemployment relief, but since then the depression has grown worse, and at that time the unnecessary and enormous Federal program of new taxation was not in sight.

"My suggestion is that immediate relief be provided out of local emergency loans, and that through a bond issue the state repay to counties, cities and poor districts all or part of the money they spend for relief under the direction of the state.

"State aid should not, of course, be given to any county, city or poor district until after it has itself done its share.

"In order to avoid any need for new taxes in 1933 the bond issue should be large enough to meet any shortage in the revenues for the 1933-1935 biennium which cannot be met by rigid economy without injury to the people. Without a bond issue either our present subsidies to schools, hospitals and universities will be cut, or new taxes will be absolutely unavoidable.

"If serial 50-year bonds are authorized, the burden of the depression will be spread over many years, and will not overburden the taxpayers at any time."

Awards J. B. John Highest Safety Honor

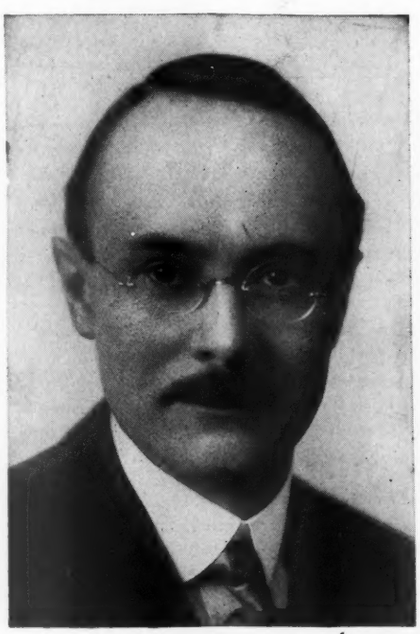
J. B. JOHN, president, Medusa Portland Cement Co., Cleveland, Ohio, was awarded the highest individual safety honor in the cement industry by the Joseph A. Holmes Safety Association recently. The award was made as a result of Mr. John's efforts in behalf of the safety of cement mill and quarry workmen.

F. L. Stone, Paul C. Van Zandt Elected Vice-Presidents

F. L. STONE, general sales manager, and Paul C. Van Zandt, assistant to president in connection with operations and engineering, recently were elected vice-presidents at a meeting of the board of directors of the Universal Atlas Cement Co., Chicago, Ill.

F. L. Stone

Mr. Stone joined the Universal Atlas company over 20 years ago as a salesman. He became successively division sales manager, assistant general sales manager and general sales manager, which latter position he has occupied since 1928.



Paul C. Van Zandt

Mr. Van Zandt, vice-president in charge of operations, came to the Universal Atlas company after 30 years' engineering and operating experience in the cement manufacturing field in the United States, Canada, Mexico, Cuba and the Orient. He is the inventor of the Compeb double grinding cement mill. For five years he was chief engineer of the Asano Portland Cement Co. in Tokyo and prior to that was connected for 18 years with the Allis-Chalmers Manufacturing Co. in connection with cement plant work. He is a mechanical engineering graduate from Purdue University.

Files Answer in Stock Suit

AN ANSWER setting out a general denial of the allegations in the plaintiff's petition has been filed by defense attorneys in the $2,300,000 claim against the estate of C. H. McNider, brought by F. A. Ontjes, Mason City, Ia., attorney and stockholder in Northwestern States Portland Cement Co.

The answer states that Mr. Ontjes is barred from recovery on his claim because of his failure to file the claim within 12 months after public notice of the appointment of Col. Hanford MacNider and Mrs. May H. McNider as executors of the estate.

In regard to the several thousand shares of stock in the Alpha Portland Cement Co. claimed by Mr. Ontjes to have been purchased by C. H. McNider in his lifetime while acting as an officer of the Northwestern States Portland Cement Co., the answer states that the stock was disposed of prior to October 1, 1925, and the proceeds accounted for to the Northwestern States Portland Cement Co. more than five years before the filing of the plaintiff's claim.

The answer declares that any pretended claim now is barred by the general statute of limitations.

It is further claimed by the defense that all matters pertaining to the Northwestern States Portland Cement Co., of which Mr. Ontjes complains, were done openly and made of record, and that he had opportunity to know the same, but that he made no claim during Mr. McNider's lifetime nor during the time provided by statute for filing claims against the estate.

The answer asks that the court disallow and dismiss the $2,300,000 claim.—*Des Moines* (Ia.) *Register.*

Company Wins Silicosis Suit

AFTER deliberating for half an hour a jury, in the case of Russell Keller, of Elco, against the Tamms Silica Co., in which Mr. Keller sued for $25,000 damages, claiming his health was ruined by the silica dust, rendered a verdict in favor of the company.

The jury was convinced that his condition was due to tuberculosis and that his work in the silica was not responsible for the condition of his health. Respirators were provided for the protection of employes and a powerful suction fan helped to protect employes from contact with the dust. It was the fault of employes if they failed to use the respirators, the jury seems to have concluded.—*Anna* (Ill.) *Talk.*

Employment Maintained Despite Decreased Road Contracts

"WE ARE HEARING a good deal about employment and disputes arising as to the value of public works in aiding employment, but the records, by months, covering road work are clear evidence that road work affords much employment," says W. C. Markham, executive secretary of the American Association of State Highway Officials.

"I am basing this statement on a comparison of the contracts let and the actual enumeration of men employed by the states for the month of April," continued Mr. Markham. "There is no class of men in the country today who are making a greater effort to keep up employment than the state highway departments charged with road construction and maintenance, despite the fact that there has been a tremendous slump of contracts for the work in the first four months of 1932 compared to 1931. The highway departments by a shortening of hours and the employment of men, in many cases, not more than three days a week, has permitted them to give some employment to even a larger number of persons, although it is not for a full week.

"Last year in the month of April, in a report from 39 states, there were 2378 miles of high type road contracts let, 2836 low type, and 1956 grading. This made a total in that month of 7180 miles contracted for various stages of improvement. Comparing the same number of returns for this year in April, we find that the high type contracts let has dropped to 1262 miles, the low type to 1662, and grading to 900, making a total of 3824 miles or a reduction of over 45%. These mileages represented in money last year $95,828,518, while the contracts for this year only amount to $38,524,278.

"Despite this tremendous drop in contracts," declared Mr. Markham, "we find that during the month of April the state highway departments and the contractors working on state jobs gave employment to 205,221 over against last year's employment during the same month of 185,795.

"The reason this employment is maintained is due entirely to the methods employed in giving part time and shortening hours, although the total amount of money expended by the states will be very greatly reduced. To illustrate by comparison of a few states, I quote the following: During April of 1931 in Pennsylvania 10,102 people were given employment against 26,780 this year; Illinois, 8866 last year against 14,155 this April; likewise in Michigan 6014 in 1931 compared to 11,124 in 1932; California, 7857 against 11,071; Oregon 3537 compared to 11,821.

"While the hours of employment may be shortened and the days not a full week, the rate of wages has been maintained.

"This statement of employment and contracts covering the month of April has nothing to do with the employment of men back of the job. It is conceded by all who keep account of these matters that there are two men behind the job furnishing materials for every man working directly on the job. I make this statement despite some publicity that is being made these days to the contrary.

"This readily shows," concluded Mr. Markham, "that road work is very effective in aiding employment and it is very questionable if there is any other industry, if you want to call it that, that does or can afford more relief over a larger territory, among all classes of people, than what is being made these days to the contrary."
being accomplished by the State Highway Dpartments in developing our road systems during these tryng times."

New Company Takes Over Quarry

THE DAKOTA Quartzite Co., located in Sioux Falls, S. D., has been capitalized at $25,000 by H. J. Gallagher, E. R. Gallagher and J. C. Parliman, all of Sioux Falls, according to a report from the office of the secretary of state. The concern has been organized primarily to carry on quarrying operation and has taken over the quarry formerly operated by the Dakota Granite Co. in West Sioux Falls. H. J. Gallagher is in charge of the new company. He has been in the quarry business for the past 30 years and for the past 11 years has been a resident of Sioux Falls as manager of the Wisconsin Granite Co.—*Sioux Falls* (S. D.) *Argus-Leader.*

Completes Puget Sound Gravel Plant

CONSTRUCTION of the Puget Sound Tug and Barge Co.'s gravel plant has been completed and the $75,000 plant will begin operations within a few days, George Cary, Seattle, Wash., vice-president of the company, announced recently.

Fourteen hundred cubic yards of gravel can be handled in an 8-hour shift. Bunkers have a storage space of 5000 yd.—*Seattle* (Wash.) *Times.*

Considers New Cement Plant in Japan

FOLLOWING an inspection trip by a committee of directors, the Asano Cement Co. is reported by the Bureau of Foreign and Domestic Commerce to be considering a new cement plant at Kirin.

It also reports that increased demand for cement during the first quarter of 1932 resulted in reduction of the production curtailment rate to 50% to apply in April and May.

The Ube Cement Co. has installed equipment to generate its own electricity, using surplus heat from the rotary kilns. This is expected to effect economies in operation.

Manufacturers Ask Republicans for Anti-Trust Law Changes

THE National Manufacturers' Association on the first night of the Republican National Convention asked the resolutions committee for a plank calling for modification of the anti-trust laws to permit industry a reasonable measure of self-regulation with a view of employment stabilization.

It urged legislation to permit voluntary agreements between sellers to such an extent as may be necessary:

1. To avoid destructive competition.
2. To avoid wastage of materials.
3. To avoid the constant incentive to capital concentration.
4. To help stabilize pay rolls.
5. To preserve earnings—the source of all tax revenues.
6. To restore industrial equilibrium by restoring equality of privilege between buyer and seller.
7. To promote the public interest by giving balanced weight to the needs of capital and labor at least equally with that of the consumer.

On taxation, public economy and expenditure the manufacturers urged a plank for reductions of expenditures and nonessental governmental activities. It calls for the repeal of the recapture clause of the transportation act, and for competition by common carriers by rail, highway, air and water under conditions of equality.

Another plank asked by the manufacturers deals with law enforcement, saying the personal security of the citizen should be the first business of government.

"We are overwhelming civil authority with administrative burdens and exaggerating the importance of bureaucratic administration, until organized crime becomes more profitable than organized business."—*Chicago* (Ill.) *Tribune.*

Federal Gas Tax Expected to Curb "Bootlegging"

THE NEW FEDERAL TAX of 1c. a gallon on gasoline, which becomes effective next week, may put a crimp in the business of gasoline "bootleggers."

Every state now has its own gasoline tax, but, according to estimates received by the Bureau of Public Roads, these taxes are evaded to the extent of $100,000.000 yearly. The states last year received $537,589,717 in gasoline taxes.

State officials believe the "bootlegging" will be curtailed because the federal tax authorities have considerably more resources at their command in going after those who fail to pay taxes. Furthermore, federal authorities are not hampered by state boundary lines. At present gasoline bootleggers often do business in one state for a short time and then move to another where they are out of reach of state authorities."—*Wall Street Journal* (New York City).

United States Supreme Court Upholds Two States in Motor Truck Control

THE Supreme Court has held valid the Kansas statute putting a special tax on regulating motor transportation over the public highways of the state. Opponents challenged the constitutionality of the statute on the ground that it violated the 14th amendment.

Constitutional violation was alleged in the exemption from compliance with its provision of (1) motor carriers operated wholly within any city or village; (2) private motor carriers operated within a radius of 25 miles beyond the corporate limits of such city or village; (3) transportation of livestock and farm products to market by the owner or of supplies for his own use in his motor vehicle, and (4) transportation of school children.

The Supreme Court also upheld the validity of the recently enacted Texas statute limiting net loads that may be transported by motor trucks over highways of the state without making similar requirements and limitations for other vehicles and classes of traffic.

The law was one of the first important statutes imposing stringent regulations upon operations of motor trucks to the detriment of the railroads.

The decision answered a claim that the law favored railroads in restricting motor truck operations by stating that there was no constitutional ground for denying the state the right to foster a fair distribution of traffic to the end that all necessary facilities should be maintained.

Discussing this contention, the court said if this was the motive of the legislature, it does not follow that the classification in this case would be invalid.

"The state has a vital interest in the appropriate utilization of the railroads which serve its people as well as in the proper maintenance of its highways as safe and convenient facilities. The state provides its highways and pays for their upkeep. Its people make railroad transportation possible by the payment of transportation charges. It cannot be said that the state is powerless to protect its highways from being subjected to excessive burdens when other means of transportation are available. The use of highways for truck transportation has its manifest convenience, but we perceive no constitutional ground for denying to the state the right to foster a fair distribution of traffic to the end that all necessary facilities should be maintained and that the public should not be inconvenienced by inordinate uses of its highways for purposes of gain. This is not a case of denial of the use of the highways to one class of citizens as opposed to another, or of limitations having no appropriate relation to highway protection."

General Material Co. to Operate with Non-Union Help

THE General Material Co., St. Louis, Mo., whose union employes are on strike, planned to begin operations in its plant at Hadley and Morgan streets with non-union labor immediately, officials of the company announced recently.

With this plant, closed since May 15, running again, all units of the company will be operating with non-union labor. A. C. Butterworth, president of the company, said his organization is prepared to continue its operations in St. Louis and will pay the regular union scale, but will not pay the double time for overtime.

As a result of the strike of the drivers for the company, 38 material firms are refusing to deliver materials to construction jobs, and if this policy is maintained, construction work must close down when the present supply on hand is exhausted.

In addition it was reported 15 sand and gravel companies operating on the Mississippi and Meramec rivers have stopped operations and are not filling orders.

Mr. Butterworth said his company has no quarrel with the union and will welcome back its union employes who have not been involved in any acts of violence, but cannot under present conditions pay the double time for overtime.

The strike began when the company notified the union it would not pay the double time for overtime. In 1928 the company went 100% union. The hoisting engineers received $1.65 an hour and the chauffeurs 55 and 60c. an hour. Prior to May 15 some engineers received as high as $120 a week.

It was reported that material for some of the larger construction jobs now in progress is being shipped into St. Louis from points in Illinois.—*St. Louis* (Mo.) *Globe-Democrat.*

James Bush Herring

JAMES BUSH HERRING, 66, chairman of the board of directors of the Ottawa Silica Co., Ottawa, Ill., and a prominent figure in Ottawa industrial and commercial life for many years, died of heart disease at his winter home in Pasadena, Calif., on May 30.

In announcing the death the *Ottawa Times* said: "He had done more than perhaps any other one man to develop the sand industry in Ottawa. Coming here in 1901 as secretary, treasurer and general manager of the Ottawa Silica Co., which he and his brother, the late Charles B. Herring, had organized the year before, he directed the management of this concern from a small sand pit through its stages of growth to one of the nation's largest silica sand corporations."

Mr. Herring left Ottawa last November for a winter in the west. He was in ill health at that time, and while he was then serving as head of the Ottawa Silica Co., he had decided to retire from active business.

Born in Mechanicsburg, Penn., he lived there until he was 18 years old, when he went to Harper county, Kansas. There he become identified with the banking business.

John R. Walsh, Chicago banker, who was then president of the Wabash railroad, became acquainted with Mr. Herring and employed him to go to Bedford, Ind., to take charge and operate some stone quarries he owned there. He remained in Bedford until 1901, when he went to Ottawa to become general manager of the Ottawa Silica Co., which he, his brother and Edmund B. Thornton, Bedford banker, had organized six months before.

He had been made secretary and treasurer of the company at its organization. He served as general manager of the concern from 1901 until 1923, when he became chairman of the executive board. September 2, 1929, he was elected president of the company to succeed Edmund B. Thornton. He resigned as president February 25, 1932, and was elected chairman of the board of directors.

His brother, Charles, was connected with the Ottawa Silica Co. from the time he moved to Ottawa in 1900 when the company was organized until his death nine years ago.

Win Suit in Wage Claim Against Crushed Stone Producer

ACTUAL AND PUNITIVE damages were awarded G. W. Easler, J. T. Reams, O. C. Mize and J. O. Jamison in their suit against the Saluda Crushed Stone Co., Greenville, S. C., in common pleas court recently.

According to the *Greenville News,* the suit was to recover wages they claim they lost when their pay was reduced without notification.

Testimony adduced hinged about the point of whether or not the plaintiffs were given legal notice before the defendant cut their pay.

Motion for a new trial was made by attorney for the plaintiff. The suit was for the recovery of salaries claimed by the plaintiffs from the defendant company.

Errata

IN THE June 4 issue of ROCK PRODUCTS in the article, "Practical Methods for Testing Masonry Mortar Cements," by Dr. F. O. Anderegg, the following typographical errors occurred:

On page 29 the formula given should have read:

$$\frac{3WL}{2bd^2}$$

On the same page the explanation under the top photograph, showing panel erected for spray test, should have read: "This test by direct comparison with leaking walls has been found to be none too severe."

Sand-Lime Brick Production and Shipments in May

THE FOLLOWING DATA are compiled from reports received direct from producers of sand-lime brick, located in various parts of the United States and Canada. The accompanying statistics may be regarded as representative of the industry.

Seventeen sand-lime brick plants reported for the month of May, this number being two less than the number reporting for the month of April, statistics for which were published in our issue of May 21.

Figures for the month of May indicate that production remains about the same as in the previous month. A slight decrease is shown in rail shipments, while an increase is shown in truck shipments. Stocks on hand decreased, as did unfilled orders.

Average Prices for May

Shipping point	Plant price	Delivered
Detroit, Mich.	.....	$12.50
Grand Rapids, Mich.	$10.00	.....
Jackson, Mich.	13.00	.....
Menominee, Mich.	9.50	12.00
Milwaukee, Wis.	7.50	10.50
Mishawaka, Ind.	8.00	.....
Pontiac, Mich.	10.50	12.50
Saginaw, Mich.	10.00	.....
Sioux Falls, S. Dak.	.....	13.00
Toronto, Ont., Can.	11.40	13.50

Statistics for April and May

	*April	†May
Production	2,501,990	2,469,000
Shipments (rail)	354,500	157,000
Shipments (truck)	2,575,490	2,918,990
Stocks on hand	7,264,338	4,897,032
Unfilled orders	5,430,000	2,575,000

*Nineteen plants reporting; incomplete, one not reporting stocks on hand, and seven not reporting unfilled orders. †Seventeen plants reporting; incomplete, one not reporting production, and seven not reporting unfilled orders.

Notes from Producers

Grande Brick Co., Grand Rapids, Mich., writes: "We have begun delivering sand-lime brick and sand-lime double brick on the new auditorium being built here. We have an order for 1,000,000 or more sand-lime brick for the job, of which 250,000 are to be sand-lime double brick which we are now manufacturing on a Miles machine which we put in this spring."

Recent Prices Bid and Contracts Awarded

Ames, Ia. Recent awards for graveling state roads include the following: Benton P-813, Albert Mulvenna, Edgewood, Ia., 8.4 mi. class A crushed stone, $6216; Clinton P-814, Lynch Construction Co., Des Moines, Ia., 13.9 mi. class A gravel, $10,946.25; Delaware P-633, Interstate Construction Co., Madison, Wis., 6.2 mi. second course class B crushed stone, $4929; Plymouth F-192, J. H. Hartsell, Early, Ia., aggregate for bituminous treated gravel on 18 mi., $13,230, and Benton F-258, aggregate for bituminous treated gravel on 3.2 mi., $4200.

Los Angeles, Calif. Bids on 50,000 bbl. of cement for the San Gabriel dam No. 2, recently submitted, ranged from $2.01 to $2.33 f.o.b. cement mills.

Rushford, Minn. Contract for 3000 cu. yd. of gravel for use in Beaver township has been awarded to the Murphy Gravel Co. at 43.4c. per yd. This is said to amount to 5½c. per yd. mi. of haul.

Bellefontaine, Ohio. Contract for city requirements of crushed stone has been let to the East Liberty Stone Co. of East Liberty at 85c. per ton at the crusher.

Cannelton, Ind. The county stone crusher is operating at capacity and supplying agricultural limestone to farmers, delivered, at $1.25 per ton in quantities over 100 tons and at $1.50 per ton for smaller amounts.

Bellevue, Ia. Bellevue Sand and Gravel Co., Bellevue, Ia., has been awarded contract to furnish 22,000 cu. yd. of gravel on state roads near here on the basis of 86.7c. per cu. yd.

Green Springs, Ohio. Bids recently submitted for county requirements of crushed stone amounting to 16,000 tons were 90c. per ton for all grades but screenings, on which the bid was 75c.

Plant Closes Till Prices Improve

THE CITY ROCK CO., owned by Ed. Johnson, in Tujunga wash near Roscoe, Calif., was closed down recently due to prices at which crushed rock, sand and gravel have recently been offered—as low as 35c. per ton. The Johnson plant can operate at costs as low as anybody, the *Roscoe Register* reports, but the owner finds it less expensive now to let competitors take all the losses they want. Numerous large orders were offered the City Rock Co. at the competitive prices. The plant handles 125 tons per hour—and with a wider conveyor belt could handle 200 tons per hour.

Concrete Paving Yardage

CONCRETE PAVEMENT yardage as awarded in the United States during May and for the period ending May 28 as reported by the Portland Cement Association follow:

	Yardage awarded	
	During May, 1932	To date, May 28, 1932
Roads	9,242,376	30,401,566
Streets	1,096,228	2,713,711
Alleys	21,080	116,484
Totals	10,359,684	33,231,761

Studies Sound-Proof Materials

THE United States Gypsum Co., Chicago, Ill., is conducting research on the development of sound-proof or sound-absorbent materials, according to information received from official sources. It already has a sound-control service to assist dealers and builders in installing acoustical materials.—*Chicago* (Ill.) *Daily News.*

RETAIL MATERIAL PRICES, DELIVERED, MAY 1, 1932 (COMPILED BY DEPARTMENT OF COMMERCE)

City	Portland cement, per bbl. exclu. of cont.	Gypsum wallboard, ⅜-in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, ¾-in., per ton	Gypsum plaster, neat, per ton
New Haven, Conn.	$2.40	.....	$25.00	$1.25	$2.00	.....
New London, Conn.	2.05	$25.00	18.00	1.50	3.00	$18.00
Waterbury, Conn.	2.60	30.00	18.00	1.00	2.45	18.00
Haverhill, Mass.	2.40	25.00	16.00	.....	.....	19.00
New Bedford, Mass.	2.40	25.00	16.00	1.25	2.50	16.00
Albany, N. Y.	2.34	23.85	15.75	.....	.....	16.20
Buffalo, N. Y.	2.95	21.00	18.00	2.50	2.05	16.00
Poughkeepsie, N. Y.	1.95	.....	26.00	2.25	2.20	13.00
Rochester, N. Y.	2.28	22.00	14.50	2.00	2.40	16.00
Paterson, N. J.	2.00	24.00	18.00	1.50	2.10	17.50
Trenton, N. J.	2.10	23.50	13.50	1.60	1.50	14.50
Philadelphia, Penn.	2.10	.....	13.75	1.75	2.60	16.50
Scranton, Penn.	2.40	.....	18.00	3.37	.....	18.00
Baltimore, Md.	2.10	25.00	13.00	1.85	2.50	15.50
Washington, D. C.	1.65	22.50	12.00	.....	.....	14.00
Richmond, Va.	2.80	38.00	15.75	2.05	2.85	18.00
Fairmont, W. Va.	2.60	35.00	16.00	2.70	3.25	18.00
Columbia, Tenn.	2.32	22.00	12.00	1.00	2.75	16.00
Atlanta, Ga.	2.55	36.00	15.50	2.81	2.50	20.15
Tampa, Fla.	2.40	40.00	24.00	2.00	2.80	.....
New Orleans, La.	2.35	37.20	14.00	1.85	.....	18.00
Akron, Ohio	1.81	20.00	14.00	1.40	1.96	15.50
Cincinnati, Ohio	$2.40	$25.00	$14.00	$2.36	$2.50	.....
Cleveland, Ohio	2.00	22.00	12.00	1.82	2.25	18.00
Columbus, Ohio	2.00	.....	14.00	1.22	.....	16.00
Toledo, Ohio	1.40	20.00	12.00	1.40	1.60	14.00
Detroit, Mich.	2.00	25.00	12.00	2.03	1.75	15.00
Lansing, Mich.	2.50	.....	20.00	1.80	1.80	17.50
Saginaw, Mich.	1.90	22.00	16.00	2.50	2.20	18.00
Terre Haute, Ind.	2.00	28.00	18.00	1.25	3.00	18.00
Chicago, Ill.	1.70	22.00	15.00	2.15	1.80	16.00
Louisville, Ky.	1.86	.....	15.00	2.00	2.15	17.00
Milwaukee, Wis.	1.25	22.00	18.00	1.35	1.35	15.20
Des Moines, Iowa	1.82	23.50	18.00	1.40	.....	14.00
Kansas City, Mo.	1.90	25.00	22.00	1.60	1.88	17.00
St. Louis, Mo.	2.00	.....	16.00	1.35	1.65	16.00
St. Paul, Minn.	2.10	23.00	19.00	1.25	1.75	17.00
Grand Forks, N. D.	2.50	.....	15.00	2.60	.....	18.00
Sioux Falls, S. D.	2.00	38.00	20.00	1.25	1.75	16.00
San Antonio, Tex.	2.41	39.00	20.00	2.00	2.00	19.15
Tucson, Ariz.	3.49	45.00	30.00	1.25	2.25	17.10
Los Angeles, Calif.	2.30	23.50	24.70	1.25	1.40	15.20
San Francisco, Calif.	.....	45.00	21.50	1.40	1.60	17.30
Seattle, Wash.	2.70	.....	.....	.....	.....	.....

New Machinery and Equipment

Announces New Type Dynamite

A SERIES of explosives known as "Red Cross Blasting Nos. 2, 3 and 4 F. R." is announced by E. I. du Pont de Nemours and Co., Wilmington, Del.

These so-called free-running powders actually are dynamite of special grades in loose form, the manufacturer states. They are particularly designed for use in sprung holes. Red Cross No. 2 F. R. is especially adapted for replacing black powder in this work, it is claimed. According to the manufacturer, field experience shows that 60 to 75 lb. of the free running powder will replace 100 lb. of black powder. Nos. 3 and 4 F.R. are adapted for top loads in certain types of well drill work. Red Cross Blasting No. 4 F.R. is for road work.

While the free running powders do not have any particular water resistance, it is claimed that experience indicates they may regularly be used where black powder fails because of moisture conditions.

The most economical way to detonate free running powders is by means of an electric blasting cap with a primer of at least 40% strength.

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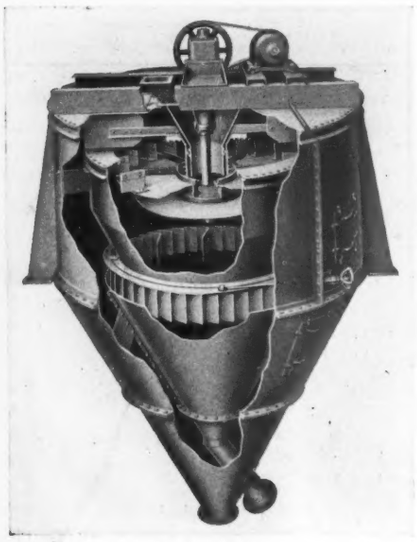
Air Separator

THE Sturtevant Mill Co., Boston, Mass., announces a new 1932 model air separator having a number of unusual features. Among the features claimed for this new separator are that its flexibility of control is practically unlimited by means of quick and easy adjustments; that its product may be modified from 30- or 40-mesh to the equivalent of 600-mesh without attaching or detaching any part or changing speed, and that tailings are winnowed to contain a minimum amount of fines. Whirl controls on adjustable return air vanes and upon interior cones regulate and assist the fines to settle more quickly, the manufacturer states. A combination of centrifugal force, gravity, suction, and adjustable baffles are used to obtain the results claimed for this separator.

The construction is said to care for all requirements. The manufacturer states there is no weaving or vibration when operating under full load and at highest speed; shafts and gears have ample margin of safety; wear and tear is low, and they have long life. Anti-friction bearings, cut and hardened gears, and stiff angles with heavy welded plates are used. Large manholes provide easy accessibility, steep cones prevent clogging, and large feed openings allow for large circulating loads. These separators are made in nine sizes from 18-in. to 18-ft.



Patented and patents pending

Simple and accurate control

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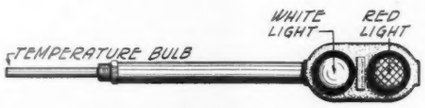
Temperature Signal

A TEMPERATURE SIGNAL device for determining temperature by means of electric lights, and known as the Thermo-Tel, is announced by the Uehling Instrument Co., Paterson, N. J.

The instrument consists of red and white lights actuated by temperature changes. When the temperature is within the limits



Signal lights tell temperature

for which the instrument is set a white light illuminates. When the temperature is above the limits a red light illuminates, and when the temperature is below the limit all lights are out. Each instrument is set for the particular limits desired for the application to which it is put. If desired the lights may be located at any distance from the temperature being observed.

The manufacturer states that these temperature signals are accurate within less than 1/10 of 1 deg. F., and can be read at a distance of 200 ft. or more.

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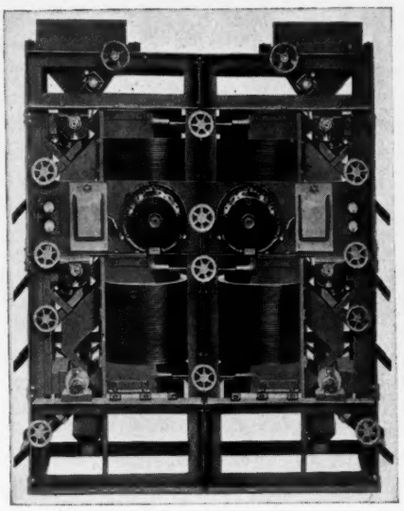
Magnetic Separator

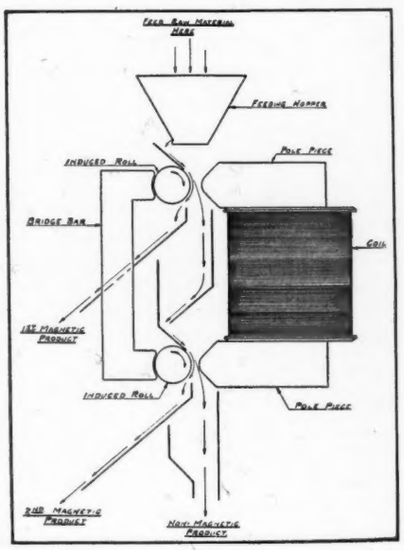
TESTS on a new type of magnetic separator designed to combine high capacity with increased separating intensity show that it will remove mica from feldspar, dolomite from gypsum, oxides of iron and embedded



Removes dolomite from gypsum

oxide particles in silica, sand, etc., and similar separations, the Dings Magnetic Separator Co., Milwaukee, Wis., announces.

There are some 40-odd minerals in addition to iron that are magnetic to a certain degree, the manufacturer states, but many of these materials can be separated only by a machine with special power for such service. Advantages claimed for this machine by the manufacturers are that it enables many producers to get premium prices for improved purity of their products, a lower cost of separation, and that it increases the range of deposits to which the magnetic separation and purification is economically applicable. The effectiveness of this new separator is in part attributed to the fact that all material is given four passes through



Path through separator

the magnetic zone. It is also said that the horseshoe-type electro-magnet concentrates all force where it belongs. Other features of this new separator include anti-friction bearings on all rolls, simplification of driving mechanism to make the mechanical load low and sensitive adjustment under the rolls.

To illustrate the possibilities in the rock products industry for magnetic separation the relative magnetic attractive force of various minerals has been given by the manufacturer, from which the following are taken:

	Attractive force
Iron	100.00
Corundum	0.83
Garnet	0.40
Quartz	0.37
Dolomite	0.22
Apatite	0.21
Talc	0.15
Magnesite	0.15
Gypsum	0.12

Ships Assembled Rotary Kilns

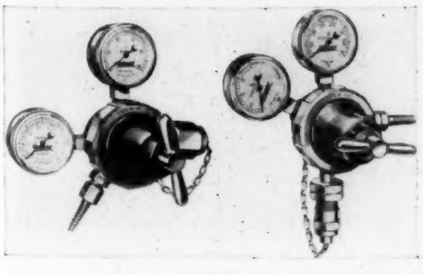
TWO ROTARY LIME KILNS, each 7½ ft. in diameter and 110 ft. long, completely assembled, were recently shipped from the plant of the Vulcan Iron Works, Wilkes-Barre, Penn., to the Bogalusa Paper Co., Bogalusa, La. Each kiln was placed on three flat cars and secured to the end cars by a steel cable at each end. Ends rested on pivoted rollers, the middle car riding free. Trainmen reported the car took the curves without difficulty.

Welding Regulators

THE Linde Air Products Co., New York, N. Y., announces two new regulators, the Oxwell Type R-48 oxygen regulator and the Oxweld Type R-49 acetylene regulator, to its line of welding and cutting apparatus. These new regulators have been designed to provide a pair of lighter duty regulators, particularly for use with the Oxweld Type W-15 welding blowpipe in the Oxweld sheet metal welding outfit, the manufacturer states.

Among the features claimed for these regulators are sturdiness, compactness, the bonnet is held in place by a forged brass cap ring to provide a non-leaking diaphragm, and assembly and disassembly are facilitated by the ribbed cap ring.

A new type of safety release is incorporated in the Oxweld Type R-48 oxygen regulator.

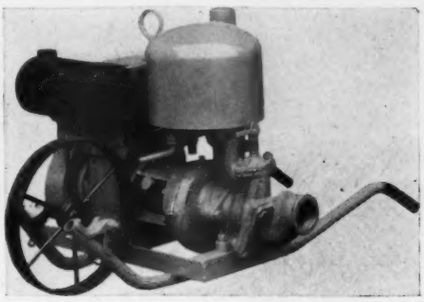


Oxygen and acetylene regulators

Portable Self-Primer Pump

THE CHAIN BELT CO., Milwaukee, Wis., announces a new 2½-in. self-priming centrifugal pump. This new self-priming unit is of the recirculating type. It is automatic in action after the recirculating system has been filled.

The Chain Belt Co. states that this size has been built to provide close to the same



Recirculating pump is automatic

light weight portability of the 2-in. class with the increased capacity of the 2½-in. class. Factory tests show that the new Rex exceeds the A.G.C. 2½-in. pump rating of 12,000 gal. per hr. on a 10-ft. suction lift and meets the maximum lift rating of 25 ft., the manufacturer states. The weight is 305 lb., height 28 in. and width 36 in.

The manufacturer claims a new and unique self-priming system which is built around a new device known as the prime control. With this control the pump recirculating system can be adjusted to assure maximum capacity and minimum priming time on any suction lift. It is claimed that this new pump will pick up its prime on a 15-ft. suction lift in less than one minute. In addition, it is claimed that the new type recirculating system will handle more cubic feet of air per minute than any air pump which could be put on this size unit.

The impeller is of the open trash type with two blades instead of four. This revised design is capable of handling a high percentage of solids and will pass any sphere up to ⅞-in. in diameter, the manufacturer states. Power is supplied by an air cooled engine. Pump and engine are mounted together on a wheelbarrow frame for one handling. A ring on top the pump permits it to be dropped down into a hole with block and tackle.

Circuit Protection

THE "De-ion" circuit breaker, said to be a safe, flameless device developed to perform the function heretofore left to carbon circuit breakers or fuses is announced by the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn.

Advantages claimed for this new circuit breaker include its low space requirements, it eliminates replacements, no live parts are exposed, and that its use reduces the size of switchboard required.

The 15 to 50 ampere breakers will be available in 1, 2 and 3 pole combinations, 125 and 250 volts. The 55 to 600 ampere breakers will be available in 2 and 3 pole combinations up to 575 volts.

To Manufacture Excavating Equipment in Canada

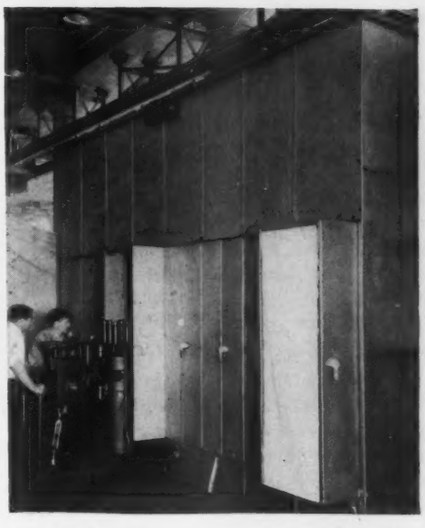
THE STEPHENS-ADAMSON MFG. Co. of Canada, Ltd., conveyor manufacturer at Belleville, Ont., has concluded an arrangement with the Orton Crane and Shovel Co. of Huntington, Ind., for the manufacture and exclusive sale in Canada of Orton locomotive cranes, dipper shovels, pull back ditchers, skimmers, clamshell buckets, orange peel buckets, traveling gantry and cantilever cranes and similar equipment. This equipment will be known as the "Saco-Orton" line.

Switchgear Adapted to Outdoor Service

MODERATE DUTY metal-clad switchgear using oil circuit breakers of oil-blast construction has been applied to outdoor service by the General Electric Co., Schenectady, N. Y. This equipment can be used in new installations where no building has been provided to house such apparatus or in existing installations where, because of under-estimated load increases, additional space indoors is not available.

This type gear includes a standard indoor metal-clad frame, various instrument, transformer, and bus compartments, and the standard removable oil circuit breaker unit. A strip space heater keeps condensation at a minimum. The housing is of rust-resisting metal and the doors are furnished with visors and curtains to protect workmen during inclement weather.

Outdoor metal-clad switch-gear, like the indoor type, is assembled complete at the factory to reduce installation expense.



Switch gear for outdoor service

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

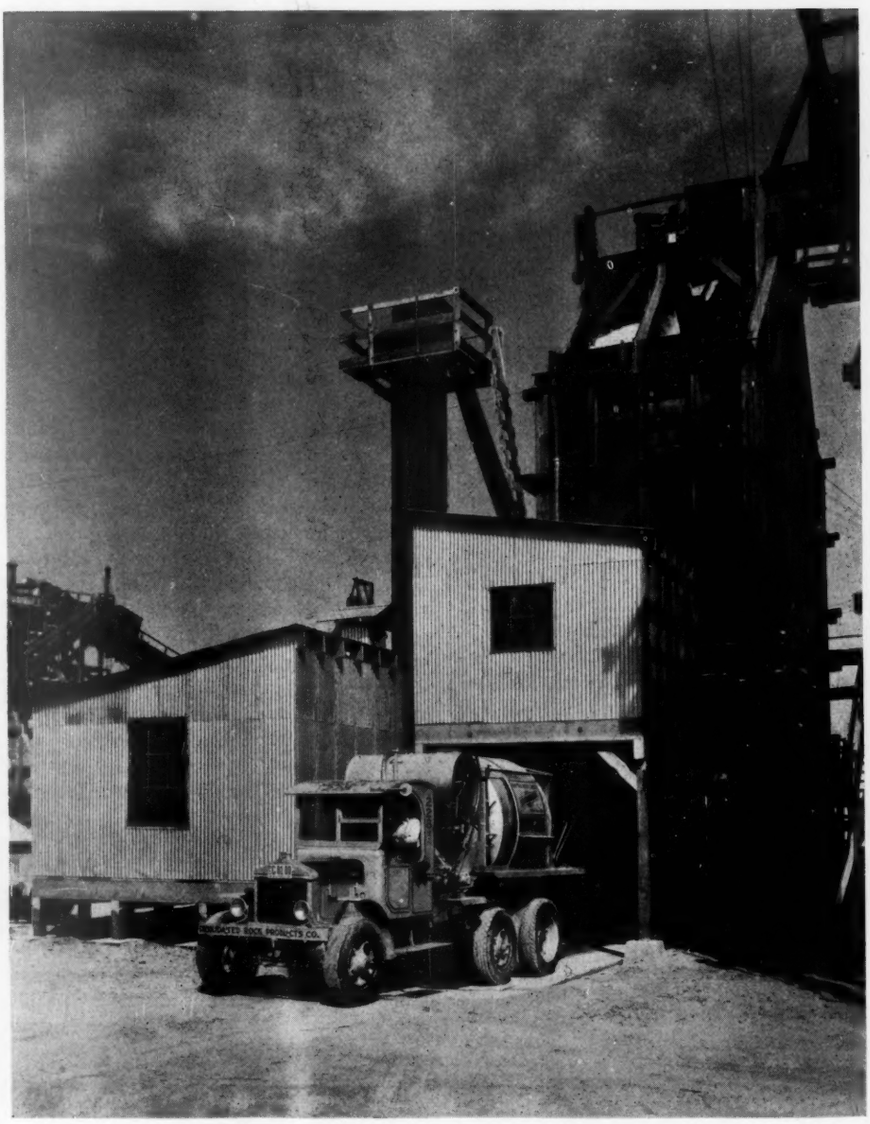
Ready-Mixed Concrete Plant of Consolidated Rock Products Co., Los Angeles, Calif.

By Edmund Shaw
Contributing Editor, Rock Products

THE Consolidated Rock Products Co. of Los Angeles, Calif., which is the largest producer of aggregate in its district, went into the ready-mixed concrete business after a thorough investigation. It was convinced by its study of the business that not only would its materials be better used, and the public be thereby benefited, but that its principal customers, the ordinary contractors, would receive much better service.

H. D. Jumper, manager of the ready-mixed department, told me this and I asked him to enumerate some of the real, bona fide advantages, such as would convince a contractor that using ready-mixed concrete would be for his benefit. For the use of ready-mixed concrete has always been opposed by a certain class of contractors who have felt that the aggregate producers who made it were going into competition with their own customers.

"Right at the start," said Mr. Jumper, "we save him from going to the building department and getting permission to pile material in the street. We also relieve him of the responsibility of hazard to traffic in bringing in material and piling it, and that amounts to something in dollars and cents. He has no trouble because of inspectors rejecting material that has been hauled to the job and piled. Then we save him a lot by preventing waste. We will send him a man who will measure the job carefully with him, if he so desires, and just that amount of concrete and no more will be delivered to him. The other way he will probably have considerable sand and rock left to be cleaned up and disposed of somehow. We go right into buildings under construction with our mixer trucks, so that concrete may be poured in them with the least lost motion, and there is nothing to clean up after them. And, also, we prevent the loss in cement sacks and a lot of other little losses such as stolen or broken lanterns and broken barri-



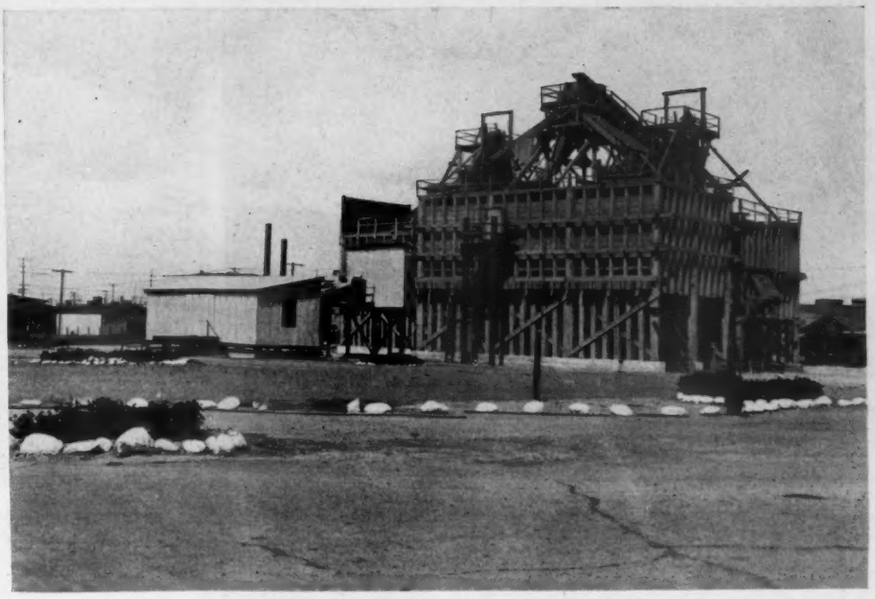
Batching plant for concrete materials at the Alameda street plant of the Consolidated Rock Products Co., Los Angeles, Calif.

cades—small in themselves but running into real money in the aggregate.

"If you are to write this, you cannot say too much about the lessened danger and inconvenience to traffic that comes from using ready-mixed concrete. We had a good illustration of what this means on a job in a hilly part of Hollywood. It was on a steep hillside, right under a 16-ft. road cut into the side of the hill and the only way in or out for several residences. But there was absolutely no place to put a mixer except on that road, which would have been badly blocked for some days if the contractor had not bought his concrete from us. As it was the road was not blocked for a minute, and the job was completed in less time than it would have taken to get the material and equipment on and off the ground.

"But we think the biggest service to the contractor is in giving him better concrete. We are quite willing to admit that there are some contractors here who know as much about making good concrete as we do and maybe more. All authorities admit that concrete averages considerably better in Los Angeles than in most American cities. But no matter how much a contractor *knows* about making concrete, he has not the facilities for the exact sampling of the materials and for weighing them and combining them that we have. Then the long mix which is given in the mixer trucks makes the concrete much more plastic than that made with a two-minute mix. There is no doubt about this. You know sidewalk contractors and those who have much finishing to do always demanded unwashed sand with about 5% of silt in their concrete. Many of those same contractors admit now that our concrete made with washed sand is just as easy to finish. In fact, some of them will not believe that such concrete could be made with washed sand and think there is some catch in it.

"And we certainly save money for the contractor. We had a good illustration of that the other day when a contractor stopped buying from us and mixed his own concrete for two days. He poured 26 yd. a day for those two days. With the same crew and buying our concrete he poured 130 yd. a day."

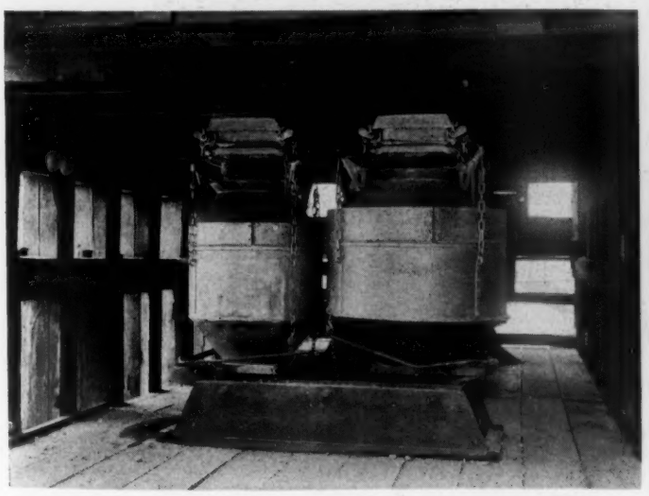


Batching plant and bunkers at Slauson avenue plant

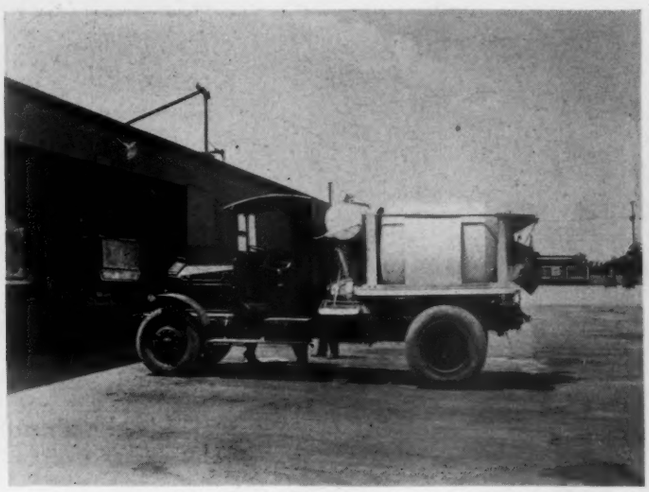
The Consolidated operates four ready-mixed plants, the main plant and office being at 26th and Alameda streets. The others are at Sherman, Slauson avenue and Home Junction. Practice is essentially the same at all three except that at 26th and Alameda streets the material comes from a pit which is also worked for material for the general market, while at the others there are big "bunkers" to which the material is brought in from some of the company's plants by rail. These bunkers were built for storage for the general market, but have not been so much used since trucking directly from the plant has been found cheaper than shipping in by rail and storing, in many cases. It is interesting to know that the ready-mixed concrete plants have given these bunkers a new value and also that the amount of material shipped in by rail has increased.

Since all the mixing is done in the truck mixers on their way to the job, the equipment is simple enough. At each plant there are four aggregate bins which are filled from the main bins by belt conveyors. The stream from the conveyor is carefully sampled at regular intervals and sieve analysis is made as soon as possible after the bin is filled. Thus the superintendent has always before him the grading of the material in every bin, and these gradings are entered on regular form sheets and filed for record. Below the bins are the weighing batchers and three kinds of these are installed in about equal number. They are made by the Blaw-Knox Co., the C. S. Johnson Co. and the Rucker Machine Co.

All cement has to be handled in sacks, because the Los Angeles city specifications forbid the use of bulk cement. It is expected that this will be changed shortly. So for each batch the sacks are counted out and placed on a shelf that surrounds a hopper. When they have been checked by an inspec-



Batchers used at the Slauson avenue plant



Truck going into garage at Alameda street plant

Two views of washing plant at 26th and Alameda streets

tor they are emptied into the hopper and the cement is run into the mixer through a valve and a canvas funnel.

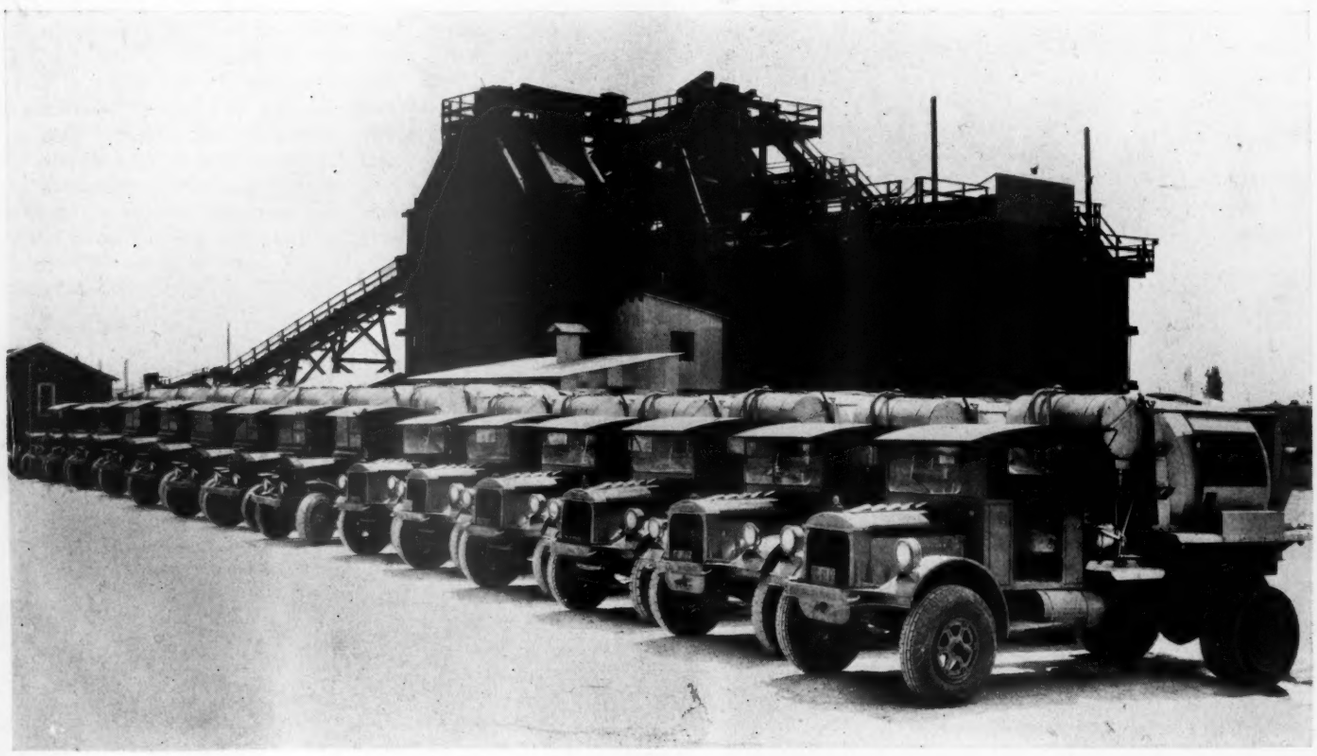
Most of the truck mixers in the big fleet are 4-yd. Jaegers, but there are a few 2-yd. and two 1½-yd. mixers of the same make. There are also two Rex 4-yd. mixers, one of which had just been received when the notes for this were being taken. All the mixers, or at least the larger sizes, are mounted on Pierce-Arrow trucks. The mixers and their motors and gearing are all painted with aluminum paint, but the trucks are painted in the company's colors, orange and green. The mixers are revolved by Waukesha and Le Roy engines, separately from those which propel the truck.

Contrary to the usual practice, the first ingredient to go in the mixer is the water. This is because it can be metered into the mixer more accurately while the truck is not moving and while it is standing on a level. Then the aggregates go in in this order: medium rock, pea gravel, coarse rock and sand. The water, of course, is far below the top of the aggregates, and when the cement is put in last it lies on top of dry sand and rock until about 15 minutes before the job is reached, when the driver starts the mixer motor.

Each batcher has to be dumped four times for a 4-yd. mix. A wire with buttons is placed near each batcher and as it is dumped the man slides a button over. This simple device has been found to save mistakes.

While the mechanical process is simple enough, there is plenty of real work in giving it the careful attention it needs and in the preliminaries. Los Angeles practice recognizes several classes of concrete, the mixes used by the city running alphabetically from Class A to Class F. Most engineers and contractors use the same classification, more or less. The most used mix for residential and industrial construction, foundations, walls and the like, is 1:2½:3½. The school board uses this but it wants the mix made to a definite fineness modulus and the sand must have a fineness modulus of 2.92 to 3.02, and the maximum size of coarse aggregate is 1-in. Other mixes which are in favor are 1:2:3, 1:2:4, and 1:2:3½. It is customary for the buyer to specify the slump wanted with such mixes.

But even though these are arbitrary proportion mixes, the grading of the aggregates has to be known in order to get the water



Part of the Consolidated fleet of truck mixers

Pit from which aggregate is taken at Alameda street plant

Pouring a driveway in a building

content right. The water is put in first and there must be enough of it to make a workable mix. It is possible to add more after the truck is at the job, but it is not possible to subtract any.

If the fineness modulus is known the exact water for any slump can be read from a table. This has been prepared from experimental work and is being corrected and brought to a little greater accuracy all the time. If the fineness modulus is kept constant the water requirement will be constant and also the yield. And this is not hard to do where the aggregate is in four sizes. So that even with arbitrary proportions it is possible in a plant like this to secure a regular and definite water-cement ratio and a constant slump and yield. Or, to put it in a few words, one batch will be just like another batch in strength, workability and slump.

With street paving and other city work the figuring of the aggregate becomes very important. This is not due to any whim or fad, for it is an absolute, demonstrable fact that the strength of concrete paving in Los Angeles has been raised from 3630 lb. aver-

LABORATORY REPORT

DATE..... LOCATION.....
ANALYSIS NO.....

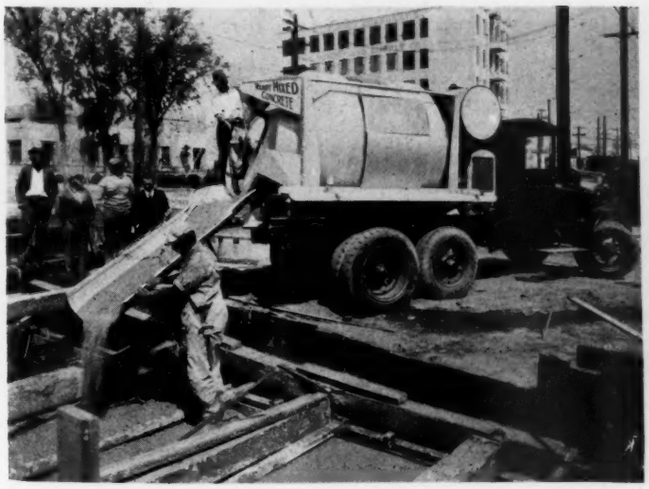
MECHANICAL ANALYSIS

FINE AGGREGATE		FINE AGGREGATE	
Plant		Plant	
Ret. on 4-m.		Ret. on ⅜-m.	
Ret. on 8-m.		Ret. on 4-m.	
Ret. on 14-m.		Ret. on 8-m.	
Ret. on 30-m.		Ret. on 16-m.	
Ret. on 48-m.		Ret. on 30-m.	
Ret. on 100-m.		Ret. on 48-m.	
F. M.		Ret. on 100-m.	
		F. M.	
Weight per cu. ft.	lbs.	Weight per cu. ft.	lbs.
Specific gravity		Specific gravity	
Voids	%	Voids	%
Moisture	%	Moisture	%
COARSE AGGREGATE		**COARSE AGGREGATE**	
Plant		Plant	
Ret. on 1½-in.		Ret. on 1½-in.	
Ret. on ¾-in.		Ret. on ¾-in.	
Ret. on ⅜-in.		Ret. on ⅜-in.	
Ret. on 4-m.		Ret. on 4-m.	
Ret. on 8-m.		Ret. on 8-m.	
F. M.		F. M.	
Weight per cu. ft.	lbs.	Weight per cu. ft.	lbs.
Specific gravity		Specific gravity	
Voids	%	Voids	%
Moisture	%	Moisture	%

NOTE: All weights per cubic foot are determined by the A. S. T. M. standard method of dry and rodded.

Tested by.....

Form of laboratory report used



Pouring a pedestrian subway while the half-closed street carries heavy traffic

Pouring a walk. Note consistency of concrete under spout

age in 1929 to 4320 lb. in 1930 solely by giving careful attention to the grading of the aggregate. This improvement has been made by working out modifications of Fuller's curve adapted to local materials, and the story of how this was done will be published in ROCK PRODUCTS shortly.

For this city work there are four mixes, known as No. 33, No. 31, No. 29 and No. 27. These numbers are the percentages of material finer than ¼-in. And for each of these there is an ideal mix which has to be met with very little tolerance.

The calculation is done on a regular form which is filed as a plant record, and it is checked by one of the city's engineers. Table No. I is a calculation for a No. 31 mix taken from one of these forms and showing the sieve analyses.

A short study of this led the superintendent to estimate that the percentages needed would be about as follows: Coarse rock, 35%; fine rock, 30%; pea gravel, 5%; and sand, 30%. So the trial mix was prepared by taking these percentages, according to Table II.

The last line, "Ideal No. 31," is exactly the grading wanted, and it may be seen that it is checked close enough for practical purposes. If it had not been so checked by the first calculation a new calculation would have been made with different percentages until a grading that was within the limits of tolerance had been reached.

The calculation of yield is of prime importance for a concrete mixing plant if waste of materials and time is to be avoided. The method used in this operation is that of finding the absolute volumes of the materials and adding them. The work is done on a form sheet which is afterward filed, and from one of these forms the calculation shown in Table III has been copied.

The weights of materials and any other information that the operator may need are then entered on a factory order sheet. As soon as the batches are weighed this goes to the records. For each job there is a complete record of everything that has been done

TABLE I—PERCENTAGES PASSING SCREEN OPENINGS

	3-in.	2½-in.	2-in.	1½-in.	¾-in.	½-in.	¼-in.	10-m.	30-m.	100-m.
Coarse rock	100.0	89.0	57.0	10.5	1.0	.....	.....	.....	.....	....
Fine rock	100.0	100.0	100.0	99.0	35.0	.....	3.0	.....	.....	....
Pea gravel	100.0	100.0	100.0	100.0	100.0	100.0	7.0	1.0	.....	....
Sand	100.0	100.0	100.0	100.0	100.0	100.0	98.5	79.5	37.5	3.0

TABLE II—PERCENTAGES PASSING SCREEN OPENINGS

	3-in.	2½-in.	2-in.	1½-in.	¾-in.	½-in.	¼-in.	10-m.	30-m.	100-m.
Coarse rock, 35%	35.0	31.2	19.9	3.7	0.3	.....	.....	.....	.....	....
Fine rock, 30%	30.0	30.0	30.0	29.7	10.5	.....	0.9	.....	.....	....
Pea gravel, 5%	5.0	5.0	5.0	5.0	5.0	5.0	0.4	0.1	.....	....
Sand, 30%	30.0	30.0	30.0	30.0	30.0	30.0	29.5	23.9	11.2	0.9
Totals	100.0	96.2	84.9	68.4	45.8	35.0	30.8	24.0	11.2	0.9
Ideal No. 31	100.0	97.5	82.0	68.0	45.5	.....	31.0	20.5	9.0	1.0

TABLE III—AGGREGATE DATA

	Specific gravity	Weight of dry material per cubic foot	Moisture based on dry weight
Cement	3.1	94 lb.	.....
Sand	2.65	105 lb.	5%
Coarse aggregate	2.67	107 lb.	1%

MATERIAL DATA FOR BATCH

	Cement	Sand	Coarse aggregate
Proportions by volume	1	2½	3½
Equivalent weights, lb.	94	262.5	374.5
Proportions by weight	1	2.79	3.98
1-yd. mix by weight	498 lb.	1391 lb.	1984 lb.
Moisture corrections	.....	69 lb.	20 lb.
Field mix as weighed	498 lb.	1460 lb.	2004 lb.

CONCRETE YIELD

Cement $\frac{94 \times 1}{3.1 \times 62.5}$ ..... 0.49 cu. ft. absolute volume

Sand $\frac{262.5}{2.65 \times 62.5}$ ..... 1.60 cu. ft. absolute volume

Coarse aggregate, $\frac{374.5}{2.67 \times 62.5}$ ..... 2.24 cu. ft. absolute volume

Water (a) $\frac{6.0}{7.5}$ ..... 0.80 cu. ft. absolute volume

Total ..... 5.13 cu. ft. absolute volume

Concrete yield for 5.3-sack batch, $\frac{5.13 \times 5.3}{27}$, equals 1.007 cu. yd.

(a) Water at 6 gal. per sack, 5.3 sacks ..... 31.8 gal.
Water contained in sand and stone ..... 10.7 gal.
Difference to be added at mixer ..... 21.1 gal.

Delivering concrete for sidewalks

Pouring a street paving job

from the time the order was received until the last of the concrete was laid and inspected and passed as O.K. These records are kept so as to be something more than statistics of the business, for they are regularly studied and digested to see if in some way a little better service may be given to the company's growing clientele.

Generally speaking, the contractor may have any mix that he will pay for. But the company will under no consideration sell a mix which it knows will not be durable or one that will not have sufficient strength for the proposed construction. For example, one customer wanted a 1:4:8 mix and he tried to show that it was strong enough for the job it was going into. But naturally the company could not afford to jeopardize its reputation for making nothing but good concrete by furnishing such a mix.

It is no accident that this business has grown steadily since its start of only a few months ago, and its continued growth would seem to depend mainly on the amount of construction in which its product may be used.

Rock Products Industry Active at Chamber of Commerce Meeting

THE ROCK PRODUCTS industry was well represented at the recent annual meeting of the Chamber of Commerce of the United States held in San Francisco, Calif. Of particular interest to the industry was the election of Lawrence C. Newlands, Portland, Ore., vice-president and general manager, Oregon Portland Cement Co., as director representing manufacture, and of Thomas R. Preston, director of the Pennsylvania-Dixie Cement Corp., as director, each to serve for two years. Other representatives of the industry included John S. McMillin, Roche Harbor Lime and Cement Co., Roche Harbor, Wash.; Robert B. Henderson, national councilor of the Chamber and also representing the Portland Cement Association; G. E. Warren, San Francisco, representing the Portland Cement Association; and A. Jeffrey Wilson, national councilor of the Chamber and representing the National Crushed Stone Association.

Arthur S. Bent, president of Bent Brothers, Inc., Los Angeles, in opening the round table conference on "Organized Effort in Construction," held as a department of the convention, made this significant statement: "Without a doubt the building industry is the key industry of the country and as such we should find it the most scientific and best organized business activity. Yet it is one of the most disorganized business on earth today. The greatest trouble is that there has been no leadership; no one of us is carrying a banner under which the rest of us are willing to travel. The solution is offered by the recently established Civic Development Department of the U. S. Chamber of Commerce, giving us the opportunity of 'putting our feet under one table,' as it were, and discussing our mutual problems for our mutual benefit."

Henry I. Harriman, chairman of the board, New England Power Association, newly elected president of the Chamber, in addressing a meeting of Trade Association Executives, said: "Give an impetus to all industry now by a large Federal appropriation to aid public or private works which may reasonably be expected to pay their way. Such a program should be considered as an emergency measure to stimulate business, provide work and obviate the dole." He also said: "I look upon the rehousing of the people of the United States in healthful homes as the outstanding task of the next generation, a task that will give far more employment to workmen of the country than did the opening of the West, the building of our industrial system, or even the motorizing of the nation."

A resolution proposed by the Portland Cement Association declared against laws and practices of states giving preferences or monopolies to their own manufacturers and suppliers in selling materials to the states and their subdivisions. The resolution was modified and passed.

A resolution was adopted by the round table conference asking that public works projects planned as relief measures be confined to necessary or to productive and self-liquidating construction; that projects be coordinated with existing works, geographical distribution and economic growth, and that they be executed . . . in accordance with established and tested business procedure. This resolution was referred to the board of directors for action.

Sets Date of Investigation of Russian Asbestos Imports

DATE for the long postponed hearing in the Tariff Commission's investigation of importations of Russian asbestos, under the unfair methods of competition provisions of the Tariff Act, has been set for September 27, it was announced on May 24.

Coincident with this announcement the commission stated that it has also instituted a survey on the subject of asbestos, under the general powers conferred in the present tariff law.—*New York* (N. Y.) *Journal of Commerce.*

New Ohio River Gravel Plant Projected

G. E. BAYNES of Batavia, Ohio, is asking Federal permission to dredge sand and gravel on the right bank of the Ohio river below Dam No. 34, Chilo, Ohio, with a dragline and deposit it in storage piles on the bank.—*Pittsburgh* (Penn.) *Post-Gazette.*

Rehearing Is Denied on "Dry-Ice" Decision

THE Supreme Court of the United States will not review the decision determining that the term "Dry-Ice" is not subject to be registered as a technical trade mark for solid carbon dioxide, Chief Justice Hughes announced on May 23. The court denied petitions for review sought by the Dry Ice Corp. of America in two suits alleging infringement of the registered mark.

The Circuit Court of Appeals for the Fifth Circuit, whose decision the Supreme Court refused to consider, ruled that the term "Dry-Ice" is descriptive of the characteristics or qualities of solid carbon doxide and that, therefore, the registration of the mark in the Patent Office is invalid.

The Dry Ice Corp. brought the suits in question to restrain the use of the term "Dry-Ice" in the corporate titles of other companies and to restrain the use of the term in advertising and selling solid carbon dioxide manufactured by the defendants. The relief sought was denied by the Circuit Court of Appeals on the ground that the proof did not show that the defendants were guilty of any wrongful conduct having the effect of falsely representing the origin or source of their product or attempting to palm it off on the purchasing public as the product of the Dry Ice Corp. and its licensees.

In urging consideration of the cases by the Supreme Court, the petitioners' brief stated that they present a situation "where the lower courts have held descriptive two words in paradox which at the time when conceived were not descriptive of the goods, consequently could not be descriptive of the characteristic of the goods and were in no sense a measure of quality." The term, it was claimed, is merely suggestive of the use to which solid carbon dioxide can be applied. "The term 'Dry Ice' does not state or describe the fact that solid carbon dioxide is or may be used as a refrigerant. 'Dry Ice' does, however, suggest the function of the article in question."

In opposing review, the respondents contended that the term "is not only descriptive of the characteristics of solid carbon dioxide, but is a most appropriate name for the product itself."

Bentonite Plant Nears Completion

CONSTRUCTION of the new plant of the Silica Products Co. at Clayspur, Wyo., is nearing completion and it is expected to be in operation in the early part of July.

The new buildings are all of steel construction. Steel storage tanks will have a capacity of more than 1600 tons. Facilities for handling are of the latest design.

Before the fire last year a car a day was shipped from the products plant.—*Cheyenne* (Wyo.) *State Tribune.*

THE INDUSTRY

Incorporations

Stone Mountain Crushed Stone Co., Decatur, Ga., $6,000. George Weiblen, Charles F. Cromer and D. B. Thornton.

Burtin Canfield, Inc., Cedar Grove, N. J., $50,000. Geo. T. Anderson, Jr., Paterson, N. J. To produce sand and gravel.

California Rock and Gravel Co., San Francisco, Calif., $200,000. John A. Sutro of San Francisco, Garry Owen of Berkeley, Calif., and F. N. Marshall.

Cement Enamel (Canada) Ltd., 149 Adelaide St. East, Toronto, Can., $40.000. To take over business of Cement Enamels Co. A. C. Mitchell, manager.

Oregon Lime and Stone Products Co., Genoa, Ohio. 250 no par shares. Henry E. Wight, Walter D. Skilliter, Henry W. Bergman and L. K. Chambers.

Lake View Sand and Gravel Co., Fond du Lac, Wis., $12,000 or 120 shares at $100 each. Pierce and Louise Percell, and Oscar R. Mueller, all of Fond du Lac.

Mortar Sales, Inc., 155 W. Congress St., Detroit, Mich., $10,000. Charles B. Kemp. 5 Meadow Lane. Grosse Pointe, Mich., Robert D. Randall, 340 E. Grand Blvd., Detroit, and Philip G. Kemp, 701 Junior Terrace, Chicago, Ill.

Somerset Sand and Gravel, Inc., Somerville, Mass.. 1000 shares common, of no par value. President, Jeremiah F. McGrath; treasurer, R. E. Moran, 27 Linden St., Somerville; and John J. Tobin, Jr.

The Caliark Corp., Gravette, Benton county, Ark., 5.000 shares with par value of $10 each. (This corporation is a holding corporation for several concerns engaged in lime, clay and mineral products developments in northwest Arkansas). L. B. and L. R. Ledgerwood and Geo. T. Strine of Dallas, Tex.

Quarries

Graham Rock Co., Long Beach, Calif., has installed a dock and unloading plant to facilitate unloading of rock from its Catalina quarry.

Pine Hill Lime and Stone Co., Mt. Vernon, Ky., is adding a new crusher to its plant to produce agricultural limestone.

Connell and Shultz, Williston, Fla., are overhauling their plant near there in preparation for supplying rock on state roads.

Kaukauna Quarry Co., Kaukauna, Wis., recently had its plant damaged by fire and suspended work until damaged equipment could be replaced.

Rich and Cox are installing crushing machinery near Aurora, Mo., to supply crushed stone on road work in that vicinity.

Basalt Rock Co., Napa, Calif., has contracted to apply oil to roadside vegetation in Fresno, Tulare and Kern counties.

Marblecliff Quarries Co., Columbus, Ohio, and its diversified operation, was recently featured in the *Columbus State Journal.*

John Spitcaufsky, who has been awarded contracts for road work near Clinton, Mo., is installing a crushing outfit on the Gaines farm, where he will obtain his supply of stone.

Glasgow, Ky. The state rock crusher is charging about 25c per ton for crushing stone on farms. The farmers are required to have the material ready for crushing.

Wapello, Ia. Louisa county board of supervisors has contracted for purchase of rock quarry south of Columbus City and the rock crushing plant will be transferred there soon.

San Orr Co., Kansas City, Mo., is erecting a rock crushing plant at Marion, Kan., and installing two crushers from which it will obtain crushed stone for its rock contract with Marion county.

Thunder Bay Quarries Co., Alpena, Mich., was recently awarded $16,928.28 damages in its suit against William J. Meagher, Bay City contractor, asking $100,000 for breach of contract in the construction of a dock and water turning-basin.

Sand and Gravel

S. C. Sand and Gravel Co., Montalvo, Calif., is building sand bunkers to improve its operation.

Burbank Rock Products Co. has been granted permission to maintain a gravel bunker at its plant in North Hollywood, Calif.

Sand Products Corp., Detroit, Mich., has contract to supply more than 500,000 tons of sand for a fill at the new Milwaukee, Wis., harbor.

M. E. Gillioz, Monett, Mo., has moved his gravel plant from Roaring river to a site below the Shell Knob.

Missouri Gravel Co., La Grange, Mo., recently suffered loss by fire to exceed $1000 at its plant No. 3, it is reported.

Vandalia, Ill. Washing equipment has been installed at the state farm to handle a thousand cubic yards of sand and gravel a day. A crusher has also been installed.

Texas Construction Materials Co. is opening a new gravel plant at Hearne, Tex., on property of H. W. Carvell of Waco. The first contract to be filled from this plant is for 1000 cars of gravel.

Acme Sand and Gravel Co., a newly formed organization at Shreveport, La., has received a bill of sale from the Acme Sand Corp. for its property and right of way with buildings and improvements situated on Lake St. in southeastern Shreveport. Consideration is reported as $15,000.

Cement

Fort Scott Hydraulic Cement Co., Fort Scott, Kan., has completed the rebuilding of its plant following a fire last fall and is now operating.

Santa Cruz Portland Cement Co., San Francisco, Calif., announces that it will maintain its employes on the pay roll and will maintain present wage scales with a few exceptions in which temporary 20% cuts will be made. At its recent all day picnic and barbecue between 500 and 600 attended.

Chicago, Ill. Among the cement companies to resume operation and who plan to start production soon are the Three Forks Portland Cement Co. with plant at Trident, Mont.; Monarch Cement Co., Humboldt, Kan.; Wolverine Portland Cement Co., Coldwater, Mich.; the Mason City, Ia., plant of Lehigh Portland Cement Co.; Hudson, N. Y., plant of Universal Atlas Cement Co., and the Lone Star Cement Co., New York, Inc., Albany.

Silica

Canon Foundry and Machine Co., Canon City, Colo., is adding a glass plant to its operation and will probably use silica sand from the Lou Miller ranch near Spikebuck.

Charleston, Miss. A new glass plant is being considered for this city and an option has been obtained on buildings for the plant. Ample reserves of high quality silica sand are readily available, it is reported. J. W. Saunders, former mayor, has been active in promoting this new industry in Charleston.

Other Rock Products

Portland, Ore. A syndicate has been formed to produce insulating brick from deposits of diatomaceous earth near Harper.

United States Potash Co., has work under way on a potash refinery at Carlsbad, New Mex., to cost approximately $900,000 with machinery.

Personals

Geo. A. Lawniczak, superintendent of the Bellevue, Mich., plant of the Alpha Portland Cement Co., has been transferred to the plant at LaSalle, Ill.

John Prince, president of the Stewart Sand and Material Co., is author of a recent article, "Great Building Resources," published in the *Kansas City* (Mo.) *Citian.* The article discussed the construction materials market in the Kansas City area.

A. L. Beeghley, president of the Bessemer Limestone and Cement Co., in commenting on its business in the Youngstown, Ohio, district recently said, "Considering all circumstances we are not doing so badly." The slag business handled has been showing slight profits even this year.

Wm. E. Odom has resigned as director of industrial relations of the National Metal Trades Association to become vice-president of Industrial Relations, Inc., and a member of the editorial staff of *Industrial Relations Magazine.* He will also act as a consultant on industrial relations problems.

Scott Turner, director of the United States Bureau of Mines and president of the American Institute of Mining and Metallurgical Engineers, received the honorary degree of Doctor of Engineering from the Michigan College of Mines, June 2. He delivered the address to the senior class at Houghton the same day.

C. E. Allen, commercial vice-president of the Westinghouse Electric and Manufacturing Co., has been elected a vice-president of the American Management Association for the term 1932-1933. He will be in charge of the Consumer Marketing Division of the A. M. A. Mr. Allen has been associated with the Westinghouse company since 1909.

Cloyd M. Chapman, consulting engineer, has been nominated for president of American Society for Testing Materials. Election will take place at the annual meeting to be held in Atlantic City, June 20. Mr. Chapman graduated in mechanical engineering from Cornell University in 1898. After serving in the Spanish-American War he was employed by Thomas Edison after which he was associated with Westinghouse, Church, Kerr and Co. until 1920, being responsible for design and construction work. Since 1920 he has been retained as consulting engineer by several companies.

Obituaries

Joseph H. Neill, 66, connected with the Irwin plant of the Spokane Portland Cement Co., Spokane, Wash., since 1912, died at his home on June 6.

Santo Randon, 45, fell 58 ft. from a ledge on which he was working when it collapsed at the Ruprecht quarry in St. Louis county, Mo. He died from injuries sustained.

George W. Page, 51, vice-president and director of the W. A. Jones Foundry and Machine Co., Chicago, Ill., died at his home May 29. Mr. Page had been with the company for 33 years, beginning his career as a shipping clerk in 1899.

Willis Leriche, vice-president of the Cement Gun Co., Allentown, Penn., was fatally injured when the plane he was flying went into a nose dive when he was about to make a landing. Mr. Leriche was also president of the Allentown Aviation Corp.; the cause of the accident was not determined.

R. D. Mahaffey, 65, vice-president and treasurer of the American Well Works, Aurora, Ill., died at his home there on June 3. He had been identified with the American Well Works and the pump industry for 43 years. He was past president of the Hydraulic Society, vice-president of the Home Building and Loan Association of Aurora, director of the Chamber of Commerce and a member of other civic and social organizations.

Manufacturers

Babcock and Wilcox Co., New York, N. Y., has been granted exclusive rights for the manufacture and sale of the automatic pressure circulating and indirect heating system of sulphite cooking developed by the Kimberly-Clark Corp.

C. O. Bartlett and Snow Co., Cleveland, Ohio, announce H. V. Schiefer is associated with it in connection with the sale of fuel and ash handling equipment and bulk material handling systems, with headquarters in Cleveland.

Thew Shovel Co. and **Universal Crane Co.**, announce appointment of Paul Cochran Equipment Co., Chicago, Ill., as sales representative in the Chicago metropolitan district. Repair parts service will continue with Western Contractors Supply Co. of Chicago.

Williams Patent Crusher and Pulverizer Co., St. Louis, Mo., announces the following appointments: Edwin D. Cassell, Cleveland, Ohio, as district representative; H. D. McCullough, Louisville, as district representative for Kentucky; and Starr Equipment Co., Pittsburgh district representative.

Blaw-Knox Co., Pittsburgh, Penn., announces appointment of Merrill G. Baker as excutive assistant to Albert C. Lehman, president. Mr. Baker graduated from Dickinson College in 1904 and has served as assistant general manager of sales of the Cambria Steel Co., assistant general manager of sales of the American Vanadium Co., and with other large industrial companies in an executive capacity.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention Rock Products.

Pneumatic Feed Drill. Bulletin 87-J describes Sullivan Class "A-5" twin cylinder pneumatic feed rock drill. SULLIVAN MACHINERY CO., Chicago, Ill.

Arc Welders. GEA-1440 illustrates construction and describes features of the new G-E arc welders, and **GEA-995B** illustrates many types of construction and maintenance work where arc welding may be used satisfactorily. GENERAL ELECTRIC CO., Schenectady, N. Y.

Our Semi-Occasional Page of Irrelevancies

A SMILE and a laugh are just as helpful sometimes in getting business, or in getting things done around a plant, as a bright idea. The editors pride themselves in the thought that most of ROCK PRODUCTS is made up of bright ideas; so that we feel justified in occasionally slipping in a page like this one:

* * * * *

"Joe" Shiely, president of the J. L. Shiely Co., St. Paul, Minn., told a few friends at the West Baden meeting of the directors of the National Sand and Gravel Association the best depression story the editor had heard.

A tramp came to a lady's back door to ask for something to eat, so bubbling over with enthusiasm or exuberance that the lady could not help but remark it.

Said she: "What's the matter with you, what are you so exuberant about this morning, don't you know there is a depression?"

"Why, Lady," said the tramp, "there is no depression, the granaries are full of grain, indeed there is a great abundance of everything; and, Lady, *all the work is done.*"

* * * * *

The more you think it over the more philosophy than humor there is in the tramp's comeback.

* * * * *

A third grade teacher asked the question: "What is a broker?"

One little girl handed in her paper with her answer as follows: "A broker is a man that bought stocks and went broke."

* * * * *

A group of professional men had gathered in the lobby of the Claypool Hotel, and proceeded to make themselves known to one another.

"My name is Fortesque," one said, extending his hand. "I'm a painter—work in water colors chiefly."

"Indeed," chimed in another. "I'm an artist, too. I work in bronze."

"Well, this is fine," a third broke in. "I'm a sculptor—I work in stone."

Then the quiet little fellow who had been inclined to keep apart stepped up, with a dry smile. "Glad to make the acquaintance of you gentlemen, for I have a common interest with you. I'm a college professor. I work in ivory."

* * * * *

A real estate man was plainly worried, and his wife asked him to tell her about the deal. It seems that he had it fixed up to sell a man a loft building, a marble yard with dock privileges, a factory site, and a summer garden, and take in part payment a block of frame tenements, a small subdivision, an abandoned lime kiln and a farm.

"He assumes a $20,000 mortgage on the loft building," explained the real estate man, "and I take over a small second mortgage on the subdivision. Do you understand?"

"I guess I get you," responded his wife. "But what is the hitch about?"

"Well, I want $4 in cash."

* * * * *

General Charles G. Dawes of Chicago is one of four brothers who are incorporated to transact business on a large scale. This is the way they are apt to describe one another, according to popular report:

Henry May Dawes says that "the General has the drive, he's the salesman, he gets things done." Beman Dawes says: "Rufe is the only one who can manage Charley." All three other brothers agree that "Beman can smell a profit farther than any of us," while Charley characterizes his youngest brother Henry as the "best blankety-blank executive I ever knew."

* * * * *

"All these delegates for me?"

"Those are candidates, friend."

* * * * *

"John," asked Mrs. Dumbell, "what do they mean by a politician carrying water on both shoulders?"

"Right now it means he is trying to carry plain water on one and firewater on the other," he replied.

* * * * *

The teacher was giving a written examination in European geography. One question was:

"Why does the sun never set on the British Flag?"

Robert wrote for the answer:

"Because they take it in at night."

* * * * *

"How long have you worked in this office?"

"Since they threatened to fire me."

* * * * *

"Any rags, bones, old papers?" queried the tramp.

"I'm afraid I don't know," confessed the householder; "my wife's away on her vacation just now."

"Any bottles, sir?"

* * * * *

"Jack, dear, why are some women called Amazons?"

"Well, my dear, I remember learning that the Amazon River has the largest mouth—"

And then the door slammed.

Two casual golf acquaintances in Florida were walking toward the green, when they sighted two women coming over a hill.

"I say," remarked one of the men, "there comes my wife with some old hag she's picked up somewhere."

"And here comes mine with another," retorted the other, icily.

* * * * *

The Smiths now lead the Cohens in New York City's latest telephone directory by a score of 1,916 to 1,636. But, if all the Cohns were added to the Cohens, and all the Smyths and the Smythes were added to the Smiths, the Cohens would then take first place as New York's leading family.

* * * * *

One of Levinsky's customers was notorious for his slowness in meeting his liabilities. He simply would not pay for goods purchased. In desperation, Levinsky sent the following letter:

"Sir: Who bought a lot of goods from me and did not pay?—You. But who promised to pay in 60 days?—You. Who didn't pay in six months?—You. Who is a scoundrel, a thief and a liar?—Yours truly, Al. Levinsky."

Importation of American Chicken Grits "Gets a Rise" Out of Britisher

VERY RECENTLY America shipped some 15,000 bags of oyster-shell chicken grits to Southampton for the English hens' encouragement towards more eggs as well as stouter shells, resulting in the following poetical effort, published in the *Manchester Guardian:*

"Alas, alas, where will it end,
This Yankee tide that rises?
We speak their slang, their films attend,
Their golfers pinch our prizes.
And now the British hen as well
(I note with eye grown moister)
Requires the trans-Atlantic shell
As shed by Yankee oysters.

"I call it treason doubly dyed,
Oh shame upon these califfs!
Are there no shells to be supplied
By genuine English natives?
Shall Colchester be wrapped in gloom,
Is Whitestable to languish,
While alien shells our hens consume
Without a trace of anguish?

"Oh, bitter news for patriot hearts,
Black day for England's lover,
The British egg, though good in parts,
Will wear a foreign cover;
And when the dawn is cold and blue,
The British cock, poor noodle,
Forgetting 'Cock-a-doodle-do,'
Will strike up 'Yankee Doodle.'"

THE LAST WORD IN AIR SEPARATOR TECHNIQUE

Unique flexibility in product regulation without changing parts or speed
Large capacities, accurate out-puts, low power and upkeep, high efficiency, sturdy construction

UNEQUALLED PERFORMANCE ~ SEND FOR ADVANCE BULLETIN

STURTEVANT MILL CO. PARK STREET HARRISON SQUARE **BOSTON, MASS.**